

Computer Use in Nursery Management.

Jerry Grebasch²

Nursery Management is a blend of art and science. The science aspects give us information that is measurable and recordable. This is the area in which the computer offers its value. Nursery Managers need not be computer programmers, but need to be able to interact with programmers. The Iowa State Forest Nursery uses six basic programs that store and retrieve information on seed lots, seedbed inventory, soil status, tree ordering, cultural practices and cost analysis.

For the past 21 years I have managed the State Forest Nursery for the Iowa Conservation Commission. Currently, production is 6 million seedlings. This is divided between conifers, hardwoods, and shrub material. Average order size is slightly over 1,200 seedlings, with between 4,500 to 5,000 orders being processed annually.

We grow trees so that we can meet reforestation needs. In many states, this can vary from large block plantings to states where plantings are relatively small and always mixed with an eye to wildlife habitat. In all cases, the seedlings must grow. There are some nurserymen who feel that their job ends when the seedlings go out the front gate. But many of us understand that we must follow these seedlings into the field and insure that the plantings are successful. We deal with a great number of variables to achieve that goal. The success of the nursery operation depends on the fact that the plants must survive and grow in the field.

I believe that nursery management is both an art and a science. In many instances, both areas affect our management procedures. As an art, we look through nursery beds, touch seedlings, pull seedlings up to look at the roots, feel the soil with our hands to check the moisture content, look with our eyes in terms of the quality and overall condition, and sometimes work from the heart on how we feel our stock is doing. As a science, nursery management requires keeping records and trying to duplicate results over successive periods of time. It's this aspect of the nursery that I'd like to address myself today, the science of record keeping and the use of computers for this monumental task.

The variation of years of experience among this group points to the need for records. Those who have been managing for a long period of time have gained a wealth of knowledge but it is essential that this knowledge be passed on to our successors, so that they too can continue to produce high quality stock. Records and notes can be passed on. I remember when I first started in this business, my teacher and I would go into the field. Various characteristics were brought to my attention for example, picking up a handful of soil to feel the moisture content. At the time, it was difficult for me to sense. Only time and experience helped. We'd go into the cold storage facility, and I'd be asked to feel the condition of the roots. Quite frankly, it was again most difficult for me to experience the same feelings that my teacher experienced. However, when we were able to get into the office and I could look at the records, I could see what the watering schedule was and then go back to the field to look at the condition of the stock. I was better able to begin understanding nursery management.

Tom Landis has asked me to address the question of when to buy a computer? My answer to that is as soon as you possibly can. I know that some are further ahead in programs for record keeping but it's none too soon for all to start recording information. I haven't found a better method of record keeping than the computer. Before the computer, many times I found myself sacrificing the information just because it would take too long to write it down. I remember walking into a nursery office and having the manager show me on the wall, a board which displayed all the cultural practices that were performed on the various nursery beds. What was shown was the desired rate of fertilization and other cultural practices. When I asked what was actually applied, there was no answer. In keeping records the desired as well as the actual results need to be recorded. The computer allows greater flexibility in which to achieve those results. Then when playing Sherlock Holmes, we can refer back to what was actually applied and

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2 Jerry Grebasch is Nursery Manager for the Iowa State Forest Nursery in Ames, Iowa.

begin to analyze the reasons for the possible success or failure of that crop. A quick survey suggests that many have written or are in the process of writing their own software programs. The major concern that I have for this entire computer proliferation is that we are repeating what others have done in the past. I think that it is essential that we stop re-inventing the wheel.

For those areas where programs haven't been written, I'd like to discuss some of the possible problems. This comes mainly from the heart, along with much experience. I think the first thing you must do is analyze the person who will be doing the programming. If that person is well grounded in forestry and nursery management you are ahead of the game. If not, as was my experience, you are going to spend alot of time and energy explaining to them what the nursery process is and getting them to understand your needs. One technique I have found quite effective is to literally draw a picture of the end result. Remember, the programs and software are not going to make decisions for you but rather aid you in making decisions; therefore, the data that you are looking at must be in usable form. It must flow and work well with your operations. Secondly, communications is a very important aspect of software development. I spent the first six months working with the programmer just to develop the terminology. One of the greatest frustrations this programmer had were the exceptions that I was willing to tolerate. The human mind is able to assimilate and put into a meaningful form diverse data on which to base decisions. To the contrary, the computer has to deal with each bit of information so that if you're going to have exceptions, they have to be worked into the programming. Of course, exceptions then make the programming job much more difficult.

I believe you must have an understanding of accounting. There's nothing worse than presenting information to the comptroller and not using basic accounting principles. They will dismiss your information so that your work and good intentions go down the drain.

One of the more important aspects of providing information is to present it in logical form. It is important to think through the steps from inputting the data to the final report. These logical steps are necessary in the programming and will prevent headaches in the future. As we were developing one of our programs, things were going very well until I asked if a particular bit of information could be added. The expression on the programmer's face said just the opposite as he said "Yes, certainly we can do just about anything, but we're going to have to go back to square one, because there is not space left in that field to record the data." Forethought in determining your goals will prevent or at least reduce some of the problems.

It is important to have a good working relationship with the people writing the program. Be sure to ask for the cost estimate of the program

in general, and specifically for any changes you request. At one point, I requested that \$50 of wages be transferred to another area. It was sometime later I learned that the charge for that correction was \$300: Since then, I always ask about the difficulty of the correction and the estimated cost.

There are several things that I would do differently. The first item would be to become more knowledgeable about computers and understand the limitations. I do not want to become a computer programmer, but I do want to know what the computer is capable of and then be able to use that information to make management decisions. I certainly feel that we need to develop educational programs that would enable managers to understand the computer. Many times, in seminars or short courses, we are told how to write programs. I don't think that's necessarily what we need. As I mentioned earlier, think out the problem. Don't rush into having something designed without thinking it through very carefully, no matter who is doing the writing. A brief description or flow chart will aid you in the whole process of program development.

There's an area that I'm still very interested in, but because of finances, have been unable to move into it thus far. The nursery is accumulating a great deal of data on growing stock, but there is one more step that needs to be implemented, the use of bar coding. Bar coding our seedling bags would allow us to trace nursery cultural practices back to the individual order. Then we would be able to develop a data base that would allow us to investigate our nursery product after it has left the nursery.

At the present time, the State Forest Nursery has six basic computer programs. First, is our seed lot information. Second, is the nursery bed inventory. Third, nursery soil data. Fourth, tree order system. Fifth, cultural practices records, and sixth, a cost analysis system.

I'd like to first address myself to the seed lot information. This is a small program but very important in two respects. First, to have at your fingertips the seed lot information that you feel important; and secondly, to have a value of your seed inventory. I was interested in some basic information: the species name, seed lot code, moisture content, germination percent, purity percent, seeds per pound, date that it was tested, who tested it, the source purchased from, the seed origin, crop year, elevation, cost per pound, the beginning weight, current weight, and the dollar value of the seed. This program was one I had written myself. I used Datastar as the input format so it provides me with a fill-in-the-blanks screen. Output is generated through Reportstar. I use this primarily for seeding information in order to know what seed we have available, the quantity, germination percent, seeds per pound, location collected, and so forth so that I can then determine which seed lot to use for our current seeding. The next report is used for our

cost accounting people to show current seed on hand and the value of that seed.

The second computer program is our nursery bed inventory. This was a program originally developed by Dr. Ware at Iowa State University, and then modified by Dan Garst to be used on the IBM PC. I do not intend to go into detail on the statistical analysis of this program but rather address how the data is entered into the computer. If any of you are interested in a copy of the thesis, please contact me. As the sample plots are taken, data is collected on sheets right in the field. These sheets are then brought into the office and using a line editor similar to MS DOS Edlin, entered into the computer. The first program is for checking errors. As an example, if you are using total number of seedlings in a plot as well as saleable number of seedlings, had those numbers been accidentally transposed, the information would be flagged and you would be able to go back and correct the data. Other items being checked are consistency of data and the reasonableness of the numbers. If the data stands up, it is then run through the second program. I should have stated earlier that our initial sample is 20 plots per species and age class. The program is run on the basic 20 plots to determine if an additional number of samples is necessary to achieve the desired degree of accuracy. This program will indicate the additional number of plots necessary and the spacing interval. With the additional plots taken and the data recorded, we then are able to run our final report to yield the number of plant-able seedlings and the standard error. This is then ,the basis for our nursery sales.

The third computer program is soil analysis data. We have purchased a Hach Soil Testing System which works very effectively for us. Data is obtained annually on the three major nutrients and seven micro-nutrients, from samples of all sections of the nursery. Of course, if there are any signs of problems, we will take soil samples immediately. The data is then recorded on paper so that it can be entered into the computer. Current data is merged with previous information to provide an historical basis in chronological order. If there is a need, we can provide a printout for the entire nursery or for a particular location in the nursery.

Fourth is the tree order system that currently handles between 4,500 and 5,000 orders, with an undefined capacity. The beginning document is the application that the landowner submits. The data is entered into our computer using a fill-in-the-blanks system which makes data entry easy for the operator. Items that are recorded include: landowner and address, shipping address if it's different from the landowner's location, county where the trees are to be planted, whether it is to be shipped or picked up, and whether sales tax is to be paid. Each species that the landowner is ordering is recorded by code. Also displayed on the screen is current inventory for that species which is then reduced by the amount of that order. On the right hand of the screen, the current bill

ing cost of trees and tax is applicable is shown. A major decision that we made in establishing this program was to allow changes to the order until just prior to shipping. I know that many will disagree, but we felt in order to better serve the public, we wanted to be sensitive to their needs. If a change is to be made, a correction sheet to the order is completed and the information is entered into the computer. The system is interactive so we are able to go into the data base and change whatever the landowner wishes. An invoice can be generated at any time after the order is entered. The invoice includes order number, species requested and available, cost, and due date. The invoice is generated with a due date so that payment not received in time will cancel the order and return the stock to our sales inventory.

A cumulative, alphabetized listing of customers is generated to enable quick cross referencing of the tree order number when a customer calls.

Once the invoice has been mailed and payment received, a credit change program is used to record order number, date of payment, and the amount paid. At the end of each entry session, a printout is generated to indicate the financial transactions of that session. Because of the last minute change capability, a second or third invoice can be issued if necessary. Any over payment reflects the need for a refund.

As shipping time approaches, a bagging list is prepared. The bagging list can be composed of all orders to be shipped, a group of orders to be shipped, a group of orders to be picked up, or a combination of orders. The bagging list is used internally in our shipping office as a means of checking the day's work and identifying the species composition of each order.

The second item generated is a bag label. This is a gummed label that is applied to our shipping bag. It carries the order number, the name and address, and the number of seedlings in each bag. This aids the people who are preparing the orders. The combinations and maximum amount that can fit into a bag change as variations occur in the stock. Corrections can easily be made to the program that generates the labels.

Another item is a report sent to the district forester indicating the landowner, county to be planted, and the make up of the order. This report can be issued throughout the season to inform district foresters of orders received and processed by the nursery. This is helpful in improving communications between the nursery and the field.

The end of the season sales report shows amount of stock sold, amount shipped, and amount picked up. There is a variety of other information all pertaining to the orders.

The fifth and sixth computer programs are a

ombination of cultural practices and cost analysis. They are grouped together because as data is collected on the cultural practices, you can very easily assign the costs to those activities. We have a labor time classification system that is broken down into four areas. The 100 series are miscellaneous activities such as miscellaneous weeding, spraying, and fertilizing. The 200 series are labor that is directly applicable to a species and age class. The 300 series represents what we call cooperation with others in the Conservation Commission, Iowa State University, and the U. S. Forest Service. The 400 series is the seed collection program. We are able to indicate the number of hours spent collecting specific species of seed.

A general classification meets the necessity of identifying and coding a wide variety of supplies and equipment on the nursery. The first part is a code classification for all seeds, fertilizers, shipping bags, etc. Each piece of equipment valued in excess of \$2,000 is a series of code numbers assigned to record labor, fuel, mileage, oil, depreciation, parts, and service.

Lastly, there is a series of miscellaneous codes for work that is done in the nursery: garbage collection, natural gas bills, and so forth. All of these costs are coded when being entered.

The nursery has three sources of input data. The time report, titled Weekly Activity Report, is completed by each employee based on half-hour increments. Second input source is the claims for purchases by the nursery. The claim is coded indicating the piece of equipment or general category that it should be charged to. Third input data is materials and amount used, desired rate, and location of area where applied, which are all recorded on paper by the employee doing the work and then entered into the computer once a week. There is a checking program that data can be run against to detect obvious errors. Once all the

data is recorded and run through the checking program stream files are permanently updated. The following is a sample of the wide variety of reports which can be derived from this data base. The bed assignment report contains location, age class, species, bedding area, bed and path area, and seed lot code. This report can also be rearranged by species. These reports are very effective for identifying useable beds for fall seeding. The next report is a current inventory of supplies on hand, including the quantity on hand, the date last purchased, quantity last purchased, and the unit price. The equipment report indicates the fuel cost per hour, gallons per hour, labor and depreciation as well as the total operating costs. These reports are invaluable when considering replacements.

There is a report on each employee which gives a break down of hours and dollars spent in each time classification. Thus, one can easily see where employees are being utilized.

The report summarizing the cost of growing seedlings shows both the direct and indirect costs. These reports can be combined to give costs of producing individual species or groups such as conifers, hardwoods, or shrubs, or total figures for the entire nursery.

Cultural practices report shows in chronological order all of the cultural practices such as the time of fertilization, time and amount of spraying, as well as the desired and actual rates of application. This then is an important tool for developing a complete program for growing nursery stock.

There is no doubt that a computer can be a very valuable tool for nursery managers. With careful planning and attention to detail, records can be developed to insure repeated production of high quality stock.