

Chapter 27

Nursery Record Systems and Computers

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Abstract

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Abstract

Nineteen Northwest bareroot nurseries were polled concerning the crop site, and administrative records they keep and their methods of recordkeeping. Seventy-nine percent of those nurseries currently use computers in some of their recordkeeping, and 95% expect to be using computers within the next 5 years. Sample printouts from the D. L. Phipps Oregon State Forest Nursery highlight features of its computerized crop recordkeeping system. Though computers have numerous applications for bareroot nurseries, they are not a panacea for good recordkeeping. Each nursery must assess its own needs to determine whether computerization is appropriate.

27.1 Introduction

In the nursery business, producing a 2- or 3-year-old seedling involves a vast array of interactive variables. When the proper combinations generate the ideal end product, nursery managers want to be able to reproduce them. One of the best ways to ensure this is through good recordkeeping.

Each nursery is unique in its physical components, objectives, administrative techniques, financial capabilities, customers, and management style. Therefore, its particular recordkeeping styles and needs probably also differ. In this chapter, I describe record types and recordkeeping methods for bareroot nurseries in the Northwest and point up advantages—and some limitations—of computerized recordkeeping.

27.2 Nursery Record Survey

I developed a separate questionnaire and circulated it to nursery managers representing the 21 nurseries participating in the OSU Nursery Survey (see chapter 1, this volume). The following 19 nurseries responded:

Canada

- Surrey Nursery
- Skimikin Nursery
- Red Rock Nursery
- Chilliwack River Nursery

United States

Private

- Weyerhaeuser: Mima Nursery, Aurora Nursery, Bonanza Nursery
- Industrial Forestry Association: Canby Nursery, Toledo Nursery, Greeley Nursery
- Tyee Tree Nursery
- Lava Nursery
- Federal (U.S.D.A. Forest Service)
 - Coeur d'Alene Nursery
 - Humboldt Nursery
 - Lucky Peak Nursery
 - J. Herbert Stone Nursery
 - Wind River Nursery

State

- Webster Forest Nursery, Washington State Department of Natural Resources
- D. L. Phipps Oregon State Forest Nursery, Oregon State Department of Forestry

Most of the questionnaire dealt with manual or computerized recordkeeping of three broad types: (1) crop, (2) site, and (3) administrative. Crop records (Table 1) include all operations for a particular crop from seed procurement through delivery of the seedling. Site records (Table 2) include any operation or physical alteration impacting the nursery site which may or may not be crop specific or have a long-range impact on the site itself. Administrative records (Table 3) include all other necessary nursery records that are not crop or site specific. Within each of these three record types are categories and subcategories listed in descending order—that is, from "most kept" to "least kept." Nurseries not keeping certain records are not necessarily disinterested or remiss. In many cases, the record is not applicable.

Summing the number of responses, by recordkeeping method, for each record type (from Tables 1, 2, and 3) and expressing each sum as a percentage of the total responses per record type give the following averages:

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
Crop	31	45	13	11
Site	33	65.5	1	0.5
Administrative	14	68	8	10

In Duryea, Mary L., and Thomas D. Landis (eds.). 1984. *Forest Nursery Manual: Production of Bareroot Seedlings*. Martinus Nijhoff/Dr W. Junk Publishers. The Hague/Boston/Lancaster, for Forest Research Laboratory, Oregon State University. Corvallis. 386 p.

These percentages show that: (1) Most of the records listed on the questionnaire are being kept by most of the nurseries; (2) the most popular recordkeeping method is manual; and (3) the most popular records for computerization seem to be crop. Thirty-five percent of the crop records are being computerized, as are 21% of the administrative records and 2% of the site records.

Fifteen of the 19 nurseries use computers in some of their recordkeeping operations. Of those 15, three have only indirect

access to a computer via central processing.¹ Twelve have direct access to a computer from the nursery: five have "stand-alone" computers,² and seven have nursery terminals.³

Direct computer access from the nursery, whether by stand-alone computer or nursery terminal, is fairly new. Although three of the nurseries have been using terminals for the past 6 years, nine have been using computers for only 18 months or less. Of the nurseries represented by this questionnaire, 95% expect to be using computers within the next 5 years, and 90% expect to have direct computer access from the nursery.

¹All information to be computerized is mailed to another (i.e., central) location for data processing; final printouts are then mailed back to the nursery.

²Computer or "intelligent" terminal at the nursery.

³Computer terminal at the nursery linked to a central computer; this allows for direct data entry and retrieval at the nursery.

Table 1. Crop records from 19 bareroot nurseries in the Northwest.

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~~~~~ Number of nurseries ~~~~~				
<b>Seed Data</b>				
Seedlot number	0	8	5	6
Owner	0	8	5	6
Species	0	8	5	6
Elevation	0	8	5	6
Seed zone	1	8	5	5
Germ. test lab	2	8	7	2
Date seed received	2	6	6	5
Inventory number	4	7	4	4
Seed crop year	4	3	7	5
Seed data information source (lab or estimate)	4	5	7	3
Certification class	5	4	6	4
% seed moisture	7	2	6	4
Germ. test date	7	1	8	3
Collection site	7	4	7	1
X-ray	11	2	4	2
Vigor class	16	0	3	0
<b>Sowing Formula Data</b>				
Kilograms to sow	1	9	5	4
Amount ordered	1	9	5	4
Planned bed feet	2	8	5	4
Harvest density	2	8	5	4
Theoretical germ.	3	7	5	4
Thousand seed weight	3	7	5	4
Germ. - chill	4	6	5	4
Theoretical falldown	4	7	5	3
Purity	6	4	5	4
% block loss	6	7	4	2
No chill germ.	11	3	2	3
<b>Stratification Data</b>				
Seedlot number	2	8	5	4
Date soaked	2	13	2	2
Kilograms expected from customer	5	11	1	2
Kilograms received from customer	5	10	1	3
Date chilled	6	10	1	2
Days chilled	7	9	1	2
Hours soaked	8	9	1	1
Seed treatment	9	8	1	1
Date dried	9	9	1	1
Problems	9	9	1	0
% moisture end stratification	14	4	1	0
% moisture mid-stratification	15	3	1	0
% moisture end soak	15	3	1	0
<b>Calibration</b>				
Total weight to sow	6	10	2	1
Number of bags	8	10	1	0
Test bag weight	9	9	1	0
<b>Øyjörd Calibration Information</b>				
Gear number	6	9	2	2
Grams/revolution	7	11	1	0
Bed feet/revolution	7	11	1	0
Zero max turns	8	7	2	2
Problems	8	10	1	0
Funnelgap	9	8	2	0

**Table 1. Crop records from 19 bareroot nurseries in the Northwest.—(Continued)**

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~ ~ ~ ~ ~ Number of nurseries ~ ~ ~ ~ ~				
<b>Actual Sowing</b>				
Location	1	12	2	4
Actual bed feet sown	1	12	2	4
Lot number	2	11	2	4
Drill adjustments	2	15	1	1
Time or date	6	9	2	2
Problems	6	11	1	1
<b>Transplanting</b>				
Lot number	4	9	1	5
Location	4	9	1	5
Actual bed feet	4	9	3	3
Time or date	5	12	1	1
Problems	6	8	1	4
<b>Weeding</b>				
Chemical	0	15	1	3
Hand	10	8	0	1
Mechanical	10	8	0	1
<b>Thinning</b>				
Prethinning density	10	6	0	3
Post -thinning density	11	5	0	3
<b>Mulching</b>				
Weed control	12	5	0	2
Frost heaving	13	5	0	1
Moisture conservation	14	3	0	2
Seed protection	15	3	0	1
Soil splash	16	2	0	1
Soil stabilization (hydromulch)	17	1	0	1
<b>Fertilizing</b>				
Soil	0	17	1	1
Foliage	11	7	0	1
<b>Pruning</b>				
Root, horizontal	5	11	0	3
Root, vertical	5	10	1	3
Top	7	9	1	2
<b>Irrigation Hours by Location</b>				
Growth	2	17	0	0
Water stress	3	16	0	0
Wash off fertilizer	7	7	2	3
Wash off chemical	9	10	0	0
	3	12	2	2
<b>Wrenching</b>				
<b>Protection</b>				
Pesticide applied	1	13	2	3
Shade screenin g	10	8	0	1
Biological control	15	4	0	0
<b>Plant Moisture Stress Records</b>				
Location	4	15	0	0
Time	5	14	0	0
<b>Tensiometer Records</b>				
Location	8	10	1	0
Time	8	10	1	0
<b>Seedling Inventory</b>				
Lot number	0	10	5	4
Location	0	10	5	4
Net	0	10	5	4
Plotinterval	1	12	4	2
Sample size	3	9	4	3
Gross	3	7	5	4
Cull	5	7	4	3
Dead	8	6	4	1

**Table 1. Crop records from 19 bareroot nurseries in the Northwest.—(Continued)**

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~~~~~ Number of nurseries ~~~~~				
Seedling Lifting				
Lot number	0	11	4	4
% lot	0	13	4	2
Time	1	12	4	2
Location	1	10	4	4
Plant moisture stress	7	7	3	2
Packing				
Date	0	12	4	3
Minimum caliper	0	12	4	3
Minimum height	0	12	4	3
Root pruning length	0	12	4	3
Lift date	1	12	3	3
Quality-control remarks volume	1	13	3	2
Plant moisture stress	3	9	4	3
	7	5	4	3
Special Service				
Double grade	3	11	3	2
Packing material	5	9	3	2
Top prune	10	5	3	1
Storage				
Prepack				
Temperature	12	6	0	1
Humidity	12	7	0	0
Duration	12	7	0	0
Post-Pack				
Temperature	1	15	0	3
Humidity	2	15	0	2
Duration	2	15	1	1
Quality-Control Remarks	4	15	0	0
Shipping				
Picked up	1	11	4	3
Delivered	3	9	4	3
Quality-control remarks	4	14	0	1
Type vehicle	8	11	0	0
Temperature	12	6	0	0
Humidity	12	6	0	1
Harvest Analysis				
Acceptable seedlings				
Height	0	12	5	2
Caliper	0	12	5	2
Shoot: root ratio	6	6	5	2
Unacceptable seedlings				
Primary cull factor	4	9	4	2

Table 2. Site records from 19 bareroot nurseries in the Northwest.

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~~~~~ Number of nurseries ~~~~~				
<b>Soil Analysis</b>				
Nutrient	0	19	0	0
pH	1	18	0	0
Organic matter	1	18	0	0
Soil series	4	15	0	0
Texture	3	16	0	0
<b>Ground Water</b>				
Drain tile	6	13	0	0
Drainage problems	9	10	0	0
Ground water table	11	8	0	0

**Table 2. Site records from 19 bareroot nurseries in the Northwest.—(Continued)**

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~~~~~ Number of nurseries ~~~~~				
Soil Amendments				
Cover crop	1	16	1	1
Organic	1	16	1	1
Fertilization (presowing)	1	15	1	2
Fumigation				
Cost/acre	4	15	0	0
Soil temperature	6	13	0	0
Plastic seal	7	11	1	0
Rates	7	11	0	1
Problems	10	9	0	0
Reshoots	10	9	0	0
Ground Preparation				
Subsoiling	6	12	1	0
Disk	7	12	0	0
Harrow	7	12	0	0
Chisel plow	8	11	0	0
Bed forming	8	11	0	0
Land plane	9	10	0	0
Float	10	9	0	0
Moldboard plow	10	9	0	0
Roller harrow	10	9	0	0
Rototiller	12	7	0	0
Roterra	13	6	0	0
Debris removal	14	5	0	0
Weather				
Date	0	18	1	0
Temperature	0	18	1	0
Rainfall	0	18	1	0
Wind speed	10	8	1	0
Solar radiation	12	6	1	0
Insects and Disease				
Problems identified	2	17	0	0
Surveys	3	16	0	0
Underground Irrigation				
Mainlines	1	18	0	0
Road and Fence Lines				
	7	12	0	0

Table 3. Administrative records from 19 bareroot nurseries in the Northwest.

Record type	None kept	Kept manually	Kept by computer	Kept manually and by computer
~~~~~ Number of nurseries ~~~~~				
<b>Nonexpendable Property Inventory</b> (buildings, vehicles, equipment, etc.)	0	15	1	3
<b>Personnel Records</b>	0	18	1	0
<b>Payroll</b>	0	9	2	8
<b>Purchasing</b>	0	14	0	5
<b>Fiscal Records</b> (budgets, tree prices, billings)	0	11	3	5
<b>Historical Crop Records</b> (transplant, sowing requests, actual transplant, sowing and production, etc.)	0	18	1	0
<b>Studies</b>	1	17	1	0
<b>Laws, Directives, and Policy</b>	2	15	2	0
<b>Customer Lists</b>	3	12	4	0
<b>Public Relations</b> (tours, gifts, news releases, etc.)	4	15	0	0
<b>Expendable Property Inventory</b> (office supplies, seed, etc.)	6	11	1	1
<b>Motor Pool</b>	9	5	1	4
<b>Cone Handling and Seed Extraction</b>	9	7	3	0

### 7.3 Computerized Crop Records: An Example

At the D. L. Phipps Oregon State Forest Nursery, we have indirect access to a large IBM model 370 computer that services four agencies. Until 4 years ago, we had not used the computer in any of our crop recordkeeping. Since that time, we have developed six major data groupings, or files, for our crop records: a seed data file, stratification data file, sowing data file, sowing location file, 1+0 inventory file, and 2+0 inventory file. Data for each of these files are entered into the computer by keypunching, edited for accuracy, and stored on hard disks for each crop. Producing printouts like those in this chapter does not require the sophistication of the IBM model 370; the data can easily be handled by several of the minicomputers available today.

Figure 1 represents a format displaying most of the components of each of our six crop files, by seedlot. (This format is currently not available on the computer but is being programmed.) Data can be manipulated and displayed by any of the components shown in Figure 1. For example, by combining our inventory and sowing location files and portions of our seed data files, we can generate a printout (Fig. 2) detailing inventory by seedlot. Informative to the customer, this printout also can be grouped with others to form a larger picture of nursery crop data.

Aggregated crop inventories are available in several formats. The one shown in Figure 3 summarizes all 2+0 inventory by density and species. We base seedling charges on a planned

production-per-bed-foot basis. Thus, this run enables us to quickly compare actual with planned production per sowing density and to establish final seedling prices. With only minor program modifications, the computer can calculate those prices.

Our bed-analysis format (Fig. 4) shows the net number of seedlings in each of our increasingly larger aggregations, i.e., seedlings per inventory plot, per seedbed, per block, and per seedlot. We use this printout in preparing lifting orders. Most of our customers prefer to pick up portions of their seedlots at several different times during the winter. This format allows us to lift as close as possible to a customer's requested seedlings per seedlot.

We use an analysis of the sowing and inventory files to compare planned and actual yields for germination, 1+0 and 2+0 inventories, and harvest. Such data are useful in fine-tuning the sowing formula and gauging production trends. A similar analysis (Fig. 5) compares planned and actual bed footages sown. Predetermined levels of difference are highlighted with asterisks (note "Percent Difference" column), which has proved useful in flagging lots to be checked for thinning. By manipulating our sowing location file, we can produce Figure 6, a chronological listing by block, pipe, and bed of each seedlot in the nursery to identify ownership, lot number, or any other known component from a bed location.

Other kinds of formats are available. A frequency distribution in table form (Fig. 7) lists the number of seedlots by seed-collection year. A frequency distribution in bar-graph format (Fig. 8) represents the number of seedlots by percent purity. This format has good visual impact as does that of Figure 9, a

<u>NURSERY SEED LOT MASTER FILE</u>					
SEED INVENTORY NUMBER _____		SEED ZONE _____		ELEVATION _____	
SEED YEAR _____		SEEDLOT NUMBER _____			
COLLECTION SITE _____		TWP _____		RANGE _____	
SEED CERT. _____		ZONE GP _____		SPECIES _____	
<u>SEED DATA</u>		<u>STRATIFICATION DATA</u>		<u>SOWING DATA</u>	
CHILL GERM % _____ NO CHILL GERM % _____ PURITY % _____ SEED WGT. _____ STORE MOIST % _____ SEED DATA TYPE _____ GERM TEST _____ TEST LAB _____ VIGOR CLASS _____ X-RAY _____		DAZE REC. _____ AMT. EXP. _____ AMT. REC. _____ SOAK DATE _____ HRS. SOAKED _____ % MOIST AFT. SOAK _____ CHILL DATE _____ DAYS CHILLED _____ % MOIST M-STRAT. _____ DRY DATE _____ % MOIST AFT. STRAT. _____ SEED TREATMENT _____ PROBLEM/COMMENT _____ GERM PLOT/MOIST _____		ORDERED M _____ STOCK TYPE _____ DENSITY _____ KG. TO SOW _____ FALLDOWN % _____ BLOCK LOSS _____ PLAN: _____ BD. FT. _____ THEO GERM _____ NO. BAGS _____ TEST BAG WGT. _____ PLOTS _____ g/REV _____ TOTAL WGT SOWN _____ BD. FT./REV _____ GEAR NO. _____ ZMT _____ FUNNEL GP _____ DATE SOWN _____ PROBLEM _____ TOTAL BD. FT. _____	
<u>SOWINGLOCATION</u>			<u>INVENTORYDATA</u>		
BLK. PIPE BED START END BLK. PIPE BED START END          			1+0 INVENTORY		2+0 INVENTORY
MINIMUM HGT. (CM):			_____		_____
MINIMUM CALP. (MM):			_____		_____
GROSS SEEDLINGS			_____		_____
NET SEEDLINGS			_____		_____
REDUCED NET			_____		_____
GROSS MEAN TREES/SQ.FT.			_____		_____
MEAN HGT. (CM)			_____		_____
					AMOUNT ORDERED _____
					*EXPECTED HARVEST _____
					TOTAL YIELD _____

Figure 1. Master-file format (in the process of being computerized) displaying most of the components of the six crop files used by the Phipps Nursery.

scattergram displaying harvest analysis data of caliper and height for the entire crop. It quickly provides an impression of seedling morphology and its distribution throughout the crop.

The dollar savings in computations alone have been substantial with computerization of our crop records. Although costs will vary with individual systems, ours might be useful indicators. Data entry by keypunching all six of our crop files, averaging 250 seedlots, costs approximately \$500 for the entire crop, or \$2 per seedlot. Inventory summaries such as that shown in Figure 2 cost approximately \$3.60 for the entire crop, or about

\$0.014 per seedlot. Crop summaries like the one shown in Figure 3 cost less than \$0.10 per page. However, these costs only reflect input and output of data; they do not include prorated costs for the overall computer-system purchase or rental, computer programming, or data storage.

In addition to direct financial savings, our nursery has benefited from the increased accuracy, speed, and versatility of the computerized system, from its long-term data storage and retrieval capabilities, and from its ability to quickly summarize and compare current data with those from previous seasons.

D.L. PHIPPS FOREST NURSERY		INVENTORY BY SEED LOT				RUN DATE 10/04/82					
SEED LOT NUMBER : A10081		INVENTORY NUMBER : 74-012-01-061-1.0-76				SEED LOT NUMBER : A100081					
SEED ZONE : 061		COLLECTION SITE :				AMOUNT ORDERED : 75,000					
ELEVATION : 1.0		HARVEST DENSITY : 25.0				STOCK TYPE : 01					
SPECIES : 0010 DOUGLAS FIR		TOWNSHIP :									
ZONE GROUP : 012 CENTRAL COAST		RANGE :									
OWNERSHIP : 02000 NON-CONTRACT		SEED CERT. CLASS : 0									
PLOT SIZE : 1.0		BED WIDTH : 4.0		STANDARD HGT : 15.0 CM		STANDARD CAL : 3.0 MM		NO. PLOTS : 78		BED FEET IN LOT : 946	
		***** 1.0 INVENTORY *****		***** 2.0 INVENTORY *****		----- SOWING LOCATION -----					
GROSS INVENTORY :		132,316		135,497		BLK PIPE		BED START		END	
DEAD :		2,285		9,135		19 34 6		9 330		1	
PERCENT :		1.7		6.7		19 35 1		330 1		1	
CULL :				28,186		19 35 2		1 295			
PERCENT :				20.8							
NET TOTAL INVENTORY :		130,031		98,176							
TREES ORDERED :		75,000		75,000		* AMOUNT *					
DIFFERENCE (ORDERED- NET) :		55,031		23,176		* ORDERED *					
PERCENT :		73.3		30.9							
REDUCED TOTAL NET :		119,363		90,125							
PERCENT :		159.1		120.1		* EXPECTED *					
						* HARVEST *					
GROSS MEAN TREES PER FOOT OF BED :		139.8		143.2							
GROSS MEAN TREES PER SQUARE FOOT :		34.9		35.8							
GROSS MEAN HEIGHT PER LOT (CM) :											
STANDARD DEVIATION :		6.06		7.39							
STANDARD ERROR :		.67		.82							
STANDARD ERROR PERCENT :		3.81		4.53							
COEFFICIENT OF VARIATION :		17.35		20.66							
NO. PLOTS 5% SAMPLE ERROR :		45.7		64.5							

Figure 2. Printout detailing inventory by seedlot.

D.L.PHIPPS FOREST NURSERY			2+0 INVENTORY - 1981					RUN DATE 9-14-82		
DENS.	SPP. CODE	TREES ORDERED	BED FEET	GROSS	DEAD	CULL	NET	DIFF. ORD-NET	REDUCED NET	MEAN TREES /B.F.
12.5	0010	20000.	493.	32314.	3538.	6350.	22426.	-2426.	20587.	45.5
17.5	0010	4295200.	72156.	5638491.	639465.	1631098.	3367928.	927272.	3091758.	46.7
17.5	0210	11200.	198.	13993.	49.	4062.	9882.	1318.	9072.	49.9
25.0	0010	12223200.	151817.	15818186.	4338764.	2835110.	8644312.	3578888.	7935478.	56.9
25.0	0210	45000.	602.	51801.	1657.	15930.	34214.	10786.	31408.	56.8
25.0	0220	10000.	120.	5362.	0.	926.	4436.	5564.	4072.	37.0
25.0	0240	9700.	140.	3425.	16.	1515.	1894.	7806.	1739.	13.5
25.0	0260	5000.	62.	3148.	0.	1021.	2127.	2873.	1953.	34.3
25.0	0320	37000.	559.	23350.	655.	3202.	19493.	17507.	17895.	34.9
25.0	0410	50000.	598.	46582.	3804.	10212.	32566.	17434.	29896.	54.5
25.0	0800	20000.	261.	27217.	153.	2806.	24258.	-4258.	22269.	92.9
30.0	0010	1963600.	21811.	2816088.	425250.	425284.	1965554.	-1954.	1804379.	90.1
30.0	0310	22000.	222.	13908.	369.	1901.	11548.	10452.	10601.	52.0
30.0	0320	10100.	139.	12075.	243.	1529.	10303.	-203.	9458.	74.1
NUR. TOTAL		18722000.	249178.	24505940.	5413963.	4941036.	14150941.	4571059.	12990564.	56.8

Figure 3. Printout summarizing all 2+0 inventory by density and species.

D.L.PHIPPS FOREST NURSERY		2+0 INVENTORY BED ANALYSIS (MEAN TREES/NET INVENTORY)										RUN DATE 8-24-81					PAGE 49										
SEED LOT NUMBER-A710080 OWNER-02000 SPECIES-0010 ZONE GROUP-073 SEED ZONE-491 STOCK TYPE-O1 DENSITY -25.0 ELEVATION-1.5																											
BLK	PIP	BED	1 NT	LEN	TOTAL	MEAN	MEAN TREES PER BED FOOT BY PLOT																				
					TREES IN BED	TREES/BD.FT.	5	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375	400	425	450	475	
08	19	3	25	431	42187	97		118	130	92	122	110	96	82	84	92	100	72	76	88	84	72	128	118			
08	19	4	25	450	51550	114	116	116	120	102	144	86	112	122	122	136	130	118	138	76	96	112	100	116			
08	19	5	25	450	45750	101	122	130	102	108	104	88	96	106	112	116	78	102	102	108	76	94	92	94			
08	19	6	25	450	52150	115	130	98	110	88	132	110	106	134	134	122	124	116	108	116	122	106	128	102			
BLOCK TOTAL					1781	191637	107																				
08	20	1	25	450	46250	102	76	90	118	84	120	106	106	120	94	110	82	96	112	108	102	106	118	102			
08	20	2	25	450	38150	84	94	82	96	100	86	90	116	108	118	44	46	56	86	78	80	82	86	78			
08	20	3	25	167	7395	44	44	56	38	48	54	36	34														
BLOCK TOTAL					1067	91795	86																				
LOT TOTAL					2848	283432	99																				

Figure 4. Printout indicating bed analysis for all 2+0 inventory, used in preparing lifting orders.

D.L. PHIPPS FOREST NURSERY					UNDERSOW AND OVERSOW PERCENT BY SEEDLOT			
SEEDLOT NUMBER	SPP. CODE	OWNER CODE	ZONE GROUP	ELEV.	PLANNED BED FEET	ACTUAL BED FEET	PERCENT DIFFERENCE	
A-40-10-80	0010	02000	020	1.0	721.1	752.0	4.29	
A-40-21-80	0010	02000	020	1.0	889.0	1262.0	41.96	
A-41-00-80	0010	02000	011	1.5	1092.5	1108.0	1.42	
A-42-00-80	0010	02000	011	1.5	1150.0	1190.0	3.48	
A-43-10-80	0010	02000	011	0.5	3017.6	3035.0	0.58	
A-43-21-80	0010	02000	011	0.5	834.9	843.0	0.97	
A-44-00-80	0010	02000	011	0.5	130.9	136.0	3.90	
A-45-00-80	0010	02000	011	1.0	552.0	566.0	2.54	
A-46-10-80	0010	02000	012	0.5	348.5	360.0	3.30	
A-46-21-80	0010	02000	012	0.5	318.6	333.0	4.52	
A-47-10-80	0010	02000	012	1.0	1173.0	1204.0	2.64	
A-47-21-80	0010	02000	012	1.0	883.2	900.0	1.90	
A-48-10-80	0010	02000	012	1.0	1467.4	1478.0	0.72	
A-48-21-80	0010	02000	012	1.0	188.6	197.0	4.45	
A-49-00-80	0010	02000	012	1.0	467.2	486.0	4.02	
A-50-10-80	0010	02000	012	1.0	273.7	277.0	1.21	
A-50-21-80	0010	02000	012	1.0	1405.3	1427.0	1.54	
A-51-00-80	0010	02000	012	1.0	143.8	99.0	-31.15	****
A-52-00-80	0010	02000	013	1.0	3473.0	3466.0	-0.20	
A-53-00-80	0010	02000	013	1.0	143.8	149.0	3.62	
A-54-00-80	0010	02000	013	1.5	448.5	433.0	-3.46	
A-55-00-80	0010	02000	013	1.5	2200.0	2154.0	-2.09	
A-56-00-80	0010	02000	030	0.5	461.2	476.0	3.21	
A-57-10-80	0010	02000	030	1.0	593.4	592.0	-0.24	
A-57-21-80	0010	02000	030	1.0	4733.4	4728.0	-0.11	
A-58-10-80	0010	02000	030	1.0	6586.1	6663.0	1.17	
A-58-21-80	0010	02000	030	1.0	1892.9	1922.0	1.54	
A-59-10-80	0010	02000	030	1.5	282.9	322.0	13.82	
A-59-20-80	0010	02000	030	1.5	710.7	735.0	3.42	
A-59-31-80	0010	02000	030	1.5	328.9	364.0	10.67	
A-60-00-80	0010	02000	040	0.5	255.3	260.0	1.84	
A-61-10-80	0010	02000	040	1.0	940.7	941.0	0.03	
A-61-20-80	0010	02000	040	1.0	5429.2	5449.0	0.36	
A-61-31-80	0010	02000	040	1.0	159.9	162.0	1.31	
A-62-00-80	0010	02000	040	1.0	359.4	353.0	-1.76	
A-63-10-80	0010	02000	040	1.5	3290.2	3198.0	-2.80	
A-63-21-80	0010	02000	040	1.5	1060.3	1051.0	-0.88	
A-64-00-80	0010	02000	040	0.5	614.1	617.0	0.47	
A-65-10-80	0010	02000	040	1.0	774.0	774.0	0.0	
A-65-20-80	0010	02000	040	1.0	201.3	204.0	1.34	
A-65-30-80	0010	02000	040	1.0	1105.2	1103.0	-0.20	
A-65-41-80	0010	02000	040	1.0	928.1	953.0	2.68	
A-66-10-80	0010	02000	040	1.5	412.9	415.0	0.51	
A-66-21-80	0010	02000	040	1.5	265.7	277.0	4.25	
A-67-00-80	0010	02000	030	1.0	862.5	859.0	-0.41	
A-69-00-80	0010	02000	030	1.5	862.5	894.0	3.65	
A-69-00-80	0010	02000	060	1.0	816.5	783.0	-4.10	
A-70-00-80	0010	02000	060	1.5	575.0	566.0	-1.67	
A-70-01-80	0010	02000	060	1.5	1920.5	1899.0	-1.12	
A-71-00-80	0010	02000	073	1.5	2875.0	2848.0	-0.94	
A-72-00-80	0010	02000	073	2.5	1035.0	960.0	-7.25	
A-77-00-80	0010	02000	030	1.5	12014.1	12031.0	0.14	
B-01-00-80	0010	01110	030	2.0	575.0	611.0	6.26	
B-02-00-80	0010	01110	011	1.5	575.0	565.0	-1.74	

Figure 5. Printout allowing comparison of planned and actual bed footages sown.



D.L. PHIPPS FOREST NURSERY					SEED LOT DATA BY SOWING LOCATION								
BLOCK	PIPE	BED	START	END	SEED LOT NUMBER	STOCK TYPE	DENS	ZONE GROUP	SEED ZONE	ELEV	SPP. CODE	OWNER CODE	DATE SOWN
20	01	1	001	090	J640082	09	25.0	011	053	2.0	0010	03250	03-19-82
20	01	2	002	080	J640082	09	25.0	011	053	2.0	0010	03250	03-19-82
20	01	3	002	090	N620082	09	25.0	050	511	3.0	0010	03240	03-19-82
20	01	4	001	088	NS20082	09	25.0	050	502	2.0	0010	03240	03-19-82
20	01	5	007	015	N520082	09	25.0	050	502	2.0	0010	03240	03-19-82
20	01	5	027	090	A600082	09	25.0	013	072	0.5	0010	02000	03-19-82
20	01	6	006	090	A600082	09	25.0	013	072	0.5	0010	02000	03-19-82
20	02	1	022	150	J610082	03	17.5	011	052	1.5	0010	03250	04-26-82
20	02	2	001	150	J610082	03	17.5	011	052	1.5	0010	03250	04-26-82
20	02	3	001	150	J610082	03	17.5	011	052	1.5	0010	03250	04-26-82
20	02	4	001	150	J610882	03	17.5	011	052	1.5	0010	03250	04-26-82
20	02	5	001	150	J610082	03	17.5	011	052	1.5	0010	03250	04-26-82
20	02	6	013	150	J610082	03	17.5	011	052	1.5	0010	03250	04-26-82
20	03	1	001	240	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	03	2	001	237	B990082	03	17.5	011	052	1.5	0010	01130	04-26-82
29	03	3	001	240	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	03	4	001	240	B950082	03	11.5	011	052	1.5	0010	01130	04-26-82
20	03	5	001	240	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	03	6	001	240	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	04	1	001	300	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	04	2	001	300	B950082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	04	3	001	227	B930082	03	17.5	011	052	1.5	0010	01130	04-26-82
20	04	3	240	300	B940082	03	17.5	011	052	1.5	0010	01130	04-23-82
20	04	4	001	300	B940082	03	11.5	011	052	1.5	0019	01130	04-23-82
20	04	5	001	300	B940082	03	17.5	011	052	1.5	0010	01130	04-23-82
20	04	6	001	300	B940082	03	11.5	011	052	1.5	0010	01130	04-23-82
20	05	1	001	375	B940082	03	11.5	011	052	1.5	0010	01130	04-23-82
20	05	2	001	375	B940082	03	17.5	011	052	1.5	0010	01130	04-23-82

Figure 6. Printout providing chronological listing of seedlot data by bed location.

## 27.4 Assessing Computer Needs

it has been said that the personal computer will totally revolutionize our private lives and the small business world within the next 5 years. Potential computer applications for bareroot nurseries are numerous, including word processing, payroll, personnel, purchasing, production records, inventories, billing, ordering, budget projections, sowing calculations, and literally dozens of other daily nursery tasks. Computer systems in use today number in the hundreds. How, then, can nursery managers find out what is available to them and appropriate for their particular needs?

**First:** Are detailed records important to your nursery? If the answer is no, a computer probably will not benefit you. Computers can store, retrieve, and manipulate large volumes of data

rapidly and accurately, but cannot turn unmotivated or disinterested recordkeepers into good recordkeepers or generate meaningful data from poor records.

**Second:** Can your nursery afford to computerize? The major cost associated with a small computer during its first 5 years of use is not the computer itself or its programs, but the personnel costs of collecting, keypunching, interpreting, and using the data. The tasks and functions to be computerized and the financial efficiencies expected must be thoroughly evaluated and a computerized system then compared with present recordkeeping methods.

**Third:** What does the market offer? If you are not familiar with computer terminology and technology, finding out what systems are available and best suited to your needs can be

CROP YEAR	NUMBER OF SEED-LOTS BY SEED-LOT YEAR AND CROP-YEAR									TOTAL
	74	75	76	77	78	79	80	81	82	
00	134	205	148	180	0	0	61	30	0	758
62	0	0	0	0	81	39	0	0	35	155
64	0	0	0	0	1	3	2	0	3	6
65	0	0	0	0	0	1	1	0	1	3
66	0	0	0	0	2	4	3	1	1	11
67	0	0	0	0	8	12	3	7	2	32
68	0	0	0	0	1	0	0	0	0	1
70	0	0	0	0	9	11	7	4	5	36
71	0	0	0	0	1	3	3	0	1	8
73	0	0	0	0	21	17	13	10	14	75
74	0	0	0	0	0	0	0	4	1	5
75	0	0	0	0	1	0	3	1	1	6
76	0	0	0	0	0	1	0	3	0	4
77	0	0	0	0	35	44	32	28	11	150
78	0	0	0	0	7	13	10	6	3	39
79	0	0	0	0	0	115	102	80	111	408
80	0	0	0	0	0	0	0	0	1	1
81	0	0	0	0	0	0	0	87	73	160
81	0	0	0	0	0	0	0	0	4	4
TOTAL	134	205	148	180	180	167	240	261	264	1862

Figure 7. Printout of frequency distribution of the number of seedlots by seed-collection and crop years.

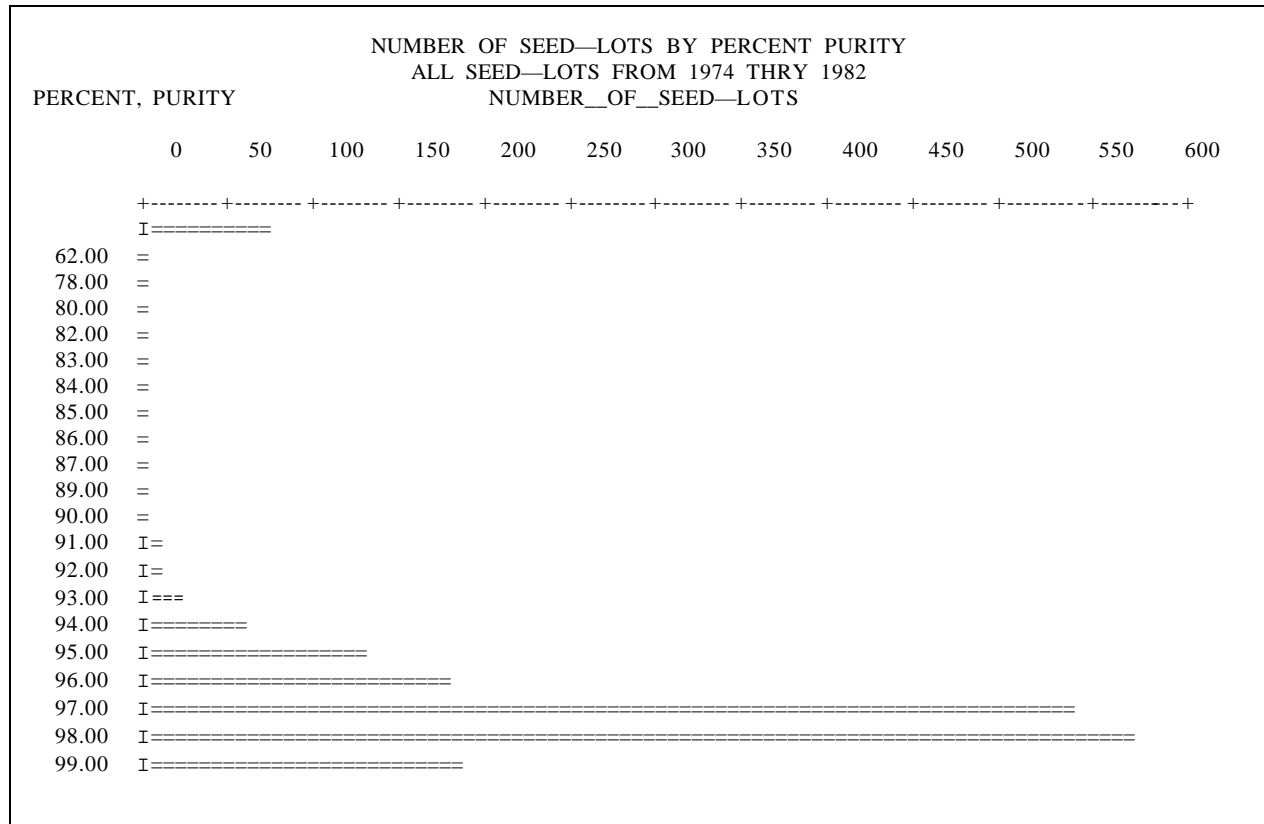


Figure 8. Printout of frequency distribution showing number of seedlots by percent purity.

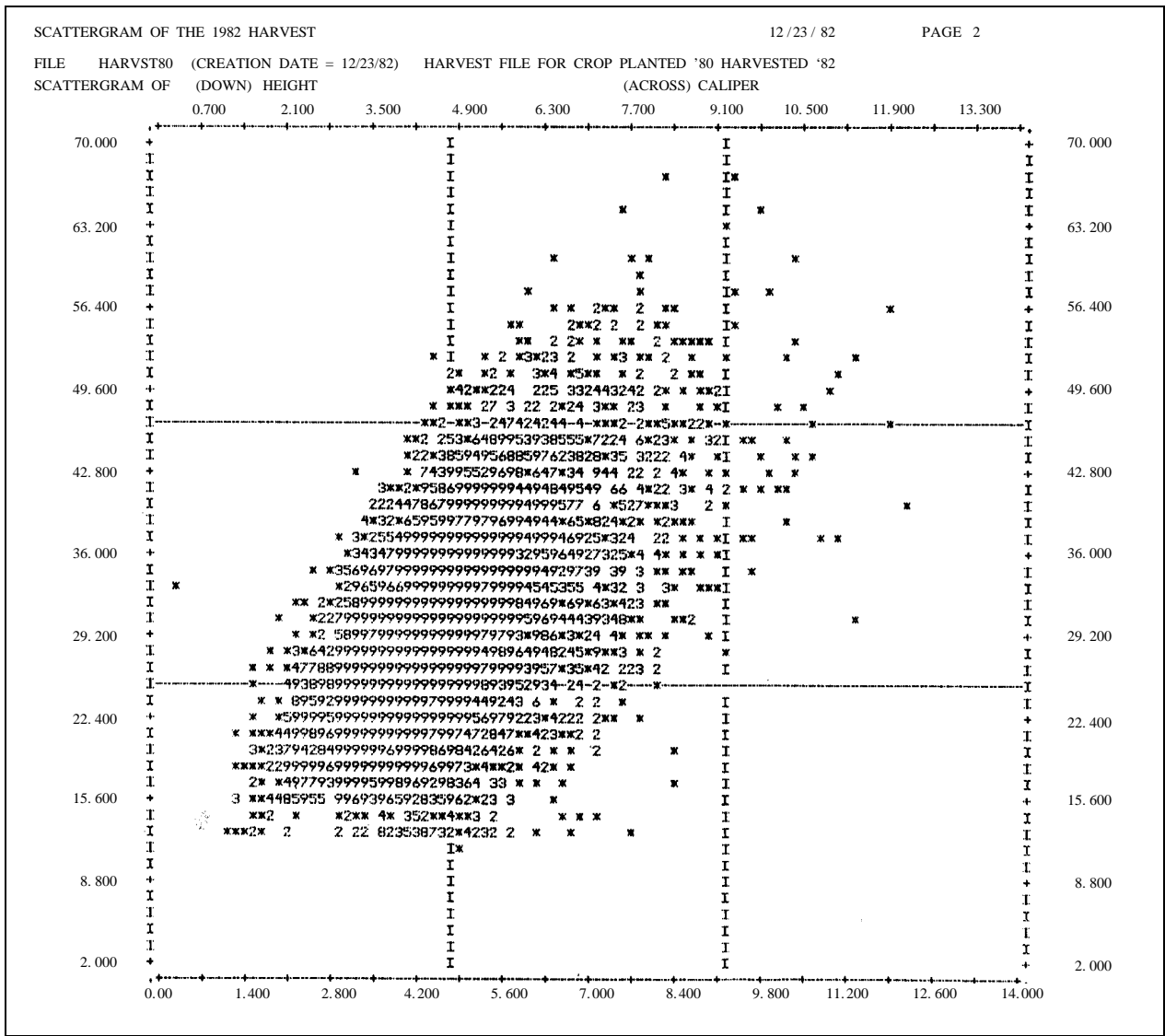


Figure 9. Printout of scattergram displaying harvest analysis data by caliper and height.

extremely frustrating. My advice is to employ a computer consultant. A consultant can give you unbiased advice about all aspects of computer hardware (machines) and software (programs) including prices, capabilities, and dependability. Other available sources of information include other nurseries already using computers, hardware and software sales personnel, local and state colleges, libraries, and a large assortment of regularly published computer magazines.

### 27.5 Conclusions

- The bareroot nursery business offers diverse and complex recordkeeping opportunities.
- Of the 19 nurseries responding to my questionnaire, 79% currently use computers in some of their recordkeeping operations, and 95% expect to be using computers within the next 5 years.

- Computer terminals and stand-alone computers at the nursery are relatively new. Of the 15 nurseries using computers, 12 have either a nursery terminal or a stand-alone computer. Nine of these have been in use less than 18 months.
- The rapid and diverse developments in the field of personal computers are revolutionizing data processing, providing nurseries with more options for recordkeeping.
- Computer consultants can serve a valuable function by assisting nurseries in evaluating their recordkeeping needs and determining what computer system might best meet those needs.
- Computers are not a panacea for good recordkeeping. They can store, retrieve, and manipulate data accurately and efficiently but cannot make good recordkeepers out of poor ones or produce meaningful analyses from inadequate or incorrect data.