

# CHAPTER 17—ADMINISTRATION, ACCOUNTING AND RECORDS

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## MAJOR CONSIDERATIONS

Forest tree nurseries are highly individual in character and the details of nursery management must be developed to fit the conditions peculiar to each operation. The larger the nursery production, up to an optimum level, the lower the cost per thousand seedlings for professional supervision, equipment and physical facilities. An important question to answer in determining whether it is profitable to have a nursery is: "How many seedlings will be required, and over what period of time?" In general, it is not economical to start a nursery in the southern pine region for less than an annual production of 10 million seedlings for a minimum of 10 years.

Most nursery activities are seasonal and must be completed within specific intervals of time. For example, the time of sowing is controlled largely by a combination of soil and atmospheric conditions. The number of days available for sowing is usually limited to about 10 to 15 between March 15 and May 10 for any particular nursery. One sowing unit consisting of workers, seeding and mulching equipment can seed "X" number of beds in "Y" number of days. If the total planned production exceeds the capacity of the one sowing unit, an additional sowing unit will be needed to complete the operation within the limited time available for sowing.

## PERSONNEL

### Nursery Manager

The forest tree nursery exists to provide seedlings for outplanting in the field. The nursery manager is involved in a specialized, often highly sophisticated practice, requiring both a detailed knowledge of tree seedlings and of the nursery management practices affecting their growth. Although the work in a forest tree nursery is similar to farming, the crop is distinctly different. The nursery manager should have some knowledge of forestry, agronomy, soil science, pathology, entomology, engineering, statistics, accounting and personnel management. This knowledge will help a nursery manager to:

1. Recognize nutritional, disease and insect problems and take prompt remedial action.
2. Design, construct, operate and maintain simple and efficient pieces of equipment to meet special needs.
3. Train a staff and organize and supervise crews.
4. Plan and efficiently execute the various nursery operations.

The role of the nursery manager has continually changed from the early days of southern nurseries until the present. The qualifications for nursery managers include the following skills and attitudes about the scope of the job.

### *Skills*

Effective nursery managers are unique individuals. The job requires an unusual combination of knowledge, aptitude, experience and attitude. A job description might list the following skills:

Accountant	Mechanic
Administrator	Mechanical engineer
Agronomist	Pathologist
Carpenter	Plant physiologist
Chemist	Plumber
Electrician	Psychologist
Entomologist	Salesman
Equipment operator	Soil scientist
Forester	Statistician
Horticulturist	Supervisor
	Welder

### *Attitudes*

A common attitude among forestry administrators is that the responsibility of the nursery manager ends when the seedlings are shipped. In contrast, the most effective nursery managers are those who are concerned about the entire regeneration system. Nothing is accomplished if high quality seedlings are grown, lifted, packed and shipped only to die at the planting site. Too often we assume that good seedling care is common knowledge, when in fact it is either unknown or forgotten by many landowners and planters.

Concern for the entire regeneration system requires a nursery manager to communicate with the landowners, the contractors, the planting crews and the management foresters. The nursery manager must understand the needs of each of these people and the seedling attributes which are important to them. Annual visits to landowners, contractors, planting crews and management foresters are essential to keep these lines of communication open.

### Full-time Employees

Full-time key staff for a nursery that produces 10 million seedlings annually should include, in addition to the nursery manager, an assistant nursery manager (or field forman) and three technicians. The skills of the technicians may vary, but these workers must all be versatile and should be able to operate and maintain equipment, keep accurate records, and work independently on any nursery activity. At least one technician should be a competent mechanic. The number of full-time employees needed increases as production increases, with an additional technician needed for each increase in production of 3 to 4 million seedlings. A full-time or part-time clerk or secretary is needed in nurseries with production above 15 million seedlings annually.

## Temporary Employees

Temporary workers are frequently needed for sowing, weeding, inventory and seedling distribution.

## Other Personnel

Many organizations employ a consultant to periodically inspect the nursery operations and make recommendations for the improvement of, or maintenance of, operations.

One unique system of handling labor in a nursery is to contract all jobs or many of the jobs that require semi-skilled labor. This system functions satisfactorily for at least one nursery.

Women frequently perform many of the nursery operations more efficiently than do men and are often more readily available. They should be considered for all jobs, including that of nursery manager.

## Training

The professional forestry school should be a source of nursery managers. Unfortunately, few schools provide specific courses in nursery management. Group training of nursery managers and technicians is limited mainly to the biennial southern nursery conferences, regional workshops on specialized subjects and specific training sessions provided by individual organizations or groups of several organizations. Professional and technical training is also acquired by individual study of books, periodic publications (e.g. *Tree Planter's Notes*), visits to other nurseries and training within the nursery.

Training of the nursery staff has been, and is, a very haphazard operation. Nursery managers include persons with degrees in forestry, agronomy, soil science, horticulture, biology and related fields; and individuals who have acquired a knowledge of nursery operations as laborers and technicians. Many of the technicians acquired their skill and knowledge as laborers and worked up through the ranks. Other technicians acquired their skills at technical or trade schools.

Many of the problems in seedling production and many of the failures in meeting production quotas are due to the lack of training, or improper training, of both the nursery manager and other workers. One of the qualifications of a nursery manager is that he or she be able to train workers and organize and supervise crews.

Many textbooks and manuals are available on training techniques—and the principles apply to nursery operations. All full-time nursery employees should know the basic answers of what, when, why and how for every operation in the nursery. For example, why is it necessary that all succulent tissue, including needles of slash pine, be treated with fungicide from April through June? Why should the soil temperature be above 60 °F before applying methyl bromide? All full-time nursery workers should

know how to correctly perform most operations in the nursery. The skill in handling each operation is acquired by repeating the operation, with checking by a supervisor until it can be done correctly on an independent basis. Even the routine operations require careful execution.

Nursery work-plans, individual job descriptions and individual work-plans are useful tools for training skilled and semi-skilled workers. These plans and job descriptions can be used as constant reminders of the correct method for performing each job. Lax job performance cannot be tolerated in nurseries where a mistake can ruin a year or several years of work.

## Planning

It is essential for nursery administrators and managers to appreciate that forest tree nursery work must be planned well in advance. Even for production of 1-0 stock, planning should precede production by 2 to 3 years. When production consists of 2-0 or 1-1 or older stock, advanced planning is much more critical.

Annual production goals are usually set by management and the nursery manager's responsibility is to meet these goals. Frequently, the seed supply is not under the control of the nursery manager. In this case there may be a lack of coordination between seed acquisition and seedling production.

Nursery planning can be simplified by a calendar of events and a work plan for each operation. Good records are essential for estimating: (A.) the annual demand for planting stock, (B.) the year-by-year production from seedbeds, sections and blocks, and (C.) the cost, labor and time requirements of each operation.

## Calendar of Events

All events should be listed, showing the season of the year or a specific time period of action. See tables 17-1 and 17-2.

## Nursery Plan of Work

A work plan is an efficient working tool useful in defining standards of work, staffing requirements, and equipment needs. A work plan can help you develop allotments for nursery operations. The work plan should be designed so that it can be revised from time-to-time as techniques change. Job descriptions should be brief, but concise and include an estimate of cost (expressed in worker-days) equipment use, and quantities of material required for each recurring job. Preparation of an original plan of work for a nursery requires considerable time and effort by the nursery manager. Many nurseries have never developed work plans or job descriptions and depend on a nursery diary (daily records) or general notes and time reports for a record of activities.

Examples of specific costs, quantities of material, and work calendars that might apply to a nursery plan for the control of diseases and insects appear in appendix 17-1. Similar examples for nursery plans for packing and distributing seedlings are given in appendix 17-2. An example of a nursery plan for maintaining high soil fertility is given in appendix 17-3.

## ACCOUNTING

Accounting systems, besides their use to determine the costs of production, frequently reveal which costs are unreasonable. The nursery manager cannot control operating costs unless they can be identified. Time and motion studies can be readily applied to most nursery operations and should be used to determine the most effective techniques for any specific operations.

Cost accounting systems vary among organizations, and are inconsistent within the South. Industries use accounting systems to provide the best tax advantage. State systems are partly related to the system of financing, i.e., whether from State appropriations or from the sale of seedlings.

Table 17-3 shows, for three nurseries, the cost of different nursery operations as a percentage of the total cost per thousand seedlings. These percentages show accounting diversity and differences among the nurseries for the same operation. Since about 1970, labor, equipment, fuels, chemicals and supplies have increased at rates of 10 to 30 percent annually. Depreciation has been a variable cost because (1) investment costs were low in the 1930's, 1940's and early 1950's, and (2) physical improvements and equipment of many State nurseries were provided by the Federal government under the Soil Bank Program.

The Forest Service nurseries maintain a more complete cost accounting than do most State and industry nurseries. Nursery expenditures are charged to the following projects:

1. First year seedlings
2. Seedling distribution
3. Maintenance of soil fertility
4. Vehicles
5. Administration
6. General maintenance
7. Investments (permanent improvements and equipment)

Costs of any operation can be readily obtained by a computer when using a coding system to charge the costs for labor, materials, supplies and equipment direct or indirect to the sub-project.

A breakdown of costs by 1-0 species or by seed lots within these species is rarely justified because when all costs are included, the cost by species shows relatively little difference in the unit cost per thousand.

The basic forms involved in a cost accounting system are for (a) payroll analysis, (b) direct expenses by projects and (c) indirect expenses of the entire nursery. All labor time except that of the nursery manager and assistant manager should be entered daily on the payroll analysis form. Cost of direct and indirect expenses can be compiled monthly. Annual costs for depreciation, taxes, insurance, etc. are included at the end of the fiscal year.

Companies and States are reluctant to divulge the cost of seedling production, mainly because of the diversity of accounting systems. Table 17-4 is an example of categories that could be used for cost accounting.<sup>1</sup>

## RECORDS

Successful nursery management can be built on a permanent basis only where records are kept of what is done and what is accomplished. Every operation in the nursery should have a purpose—there should be no room for slipshod, half-hearted measures on the basis that “it can't do much harm and it might do some good” (Armson and Sadreika 1979). The first, and most important, thing to decide is what purpose will any given record fulfill—will it provide a guide toward the technical and financial efficiency of the nursery operations? Records collected without any clear idea of their purpose may record useless information or may omit vital information needed for later considerations. Among the records kept at many nurseries are:

- A. Nursery operations
  1. Nursery journal—daily diary
  2. Weather records—precipitation, maximum and minimum temperatures.
- B. Personnel
  1. Permanent labor—payroll report and time distribution
  2. Temporary labor—weekly time report
- C. Seed
  1. Seed inventory
  2. Seed germination
  3. Seed inventory after sowing
  4. Seed shipments
- D. Seedling production
  1. Compartment sheets—records of seedling culture; sowing, spraying, weeding, irrigation, etc. The Alabama forestry Commission uses a very effective form designed by Carl Muller (figure 17-1). Cultural activities are color-coded and entered by date and location within the compartment.
  - E. Seedling distribution
    1. Lifting and storage record
    2. Seedling shipment record

<sup>1</sup>C.A. Muller, personal communication, 1980.

Table 17-1.—Calendar of events.

OPERATION	1st Quarter			2nd Quarter			3rd Quarter			4th Quarter		
	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
Stratify Seed							X	X				
Preliminary Soil Preparation					X	X	X	X	X			
Fumigate						X	X	X	X			
Fertilize					X		X	X	X			
Disc and Harrow					X			X	X	X		
Erect Water Lines					X		X	X	X	X		
Sow and Mulch (Includes Irrigate Maintenance)	X	X	X		X	X	X	X	X	X	X	X
Bird Protection					X	X		X	X	X		
Spray Weed Control	X	X	X				X	X	X	X	X	X
Hand Weeding	X	X	X							X	X	X
Apply Fertilizer (As needed)												
Spray Cronartium Rust								X	X	X	X	X
Spray Brown Spot Chlorosis--Determine Cause and Correct	X	X		X	X	X					X	X
Inventories			X									X
Clip Longleaf			X									
Collect and Chop Straw	X	X			X	X					X	X
Cut Stakes for Baling Strips	X	X		X	X	X					X	X
Sow Cover Crops (& Fertilize)		X		X						X		
Cultivate Cover Crop	X		X								X	X
Apply Sawdust		X	X	X								
Turn Under Cover Crop		X		X						X		
Assemble Materials for Packing				X								
Overhaul Lifter, Grading Tables, Etc.			X						X			
Recruit Labor for Packing and Train Key-Men				X	X							
Prepare Heal-in Bed			X									
Irrigate--Drain Oscillators and Check Valves				X	X	X	X	X				
Lift, Pack, and Ship (From each line as lifted)					Start Nov. 15	X	X	X	End Feb. 28			
Remove Water Lines					X	X	X	X	X			
Overhaul Extractory Equipment		X	X									
Locate Cone Collection Areas and Collectors	X	X	X									
Purchase and Store Cones			X	X	X							
Extract Seed and Store				X	X	X	X	X				
Establish Sowing Lots and Draw Test Samples			X	X	X	X	X	X				
Requisition Supplies	X			X			X			X		
Maintain Plant & Equipment	X	X	X	X	X	X	X	X	X	X	X	X
Maintain Nursery Records	X	X	X	X	X	X	X	X	X	X	X	X

Table 17-2. — Nursery job list

January 1	Maintain all equipment	July 15	Apply for imprest fund cashiers (2)
January 1	Treat soil crop area with Dieldrin	July 15	Cone Crop Est.
January 1	Begin soil fumigation	July 20	Send samples of longleaf seed lots to Lab by Aug. 1 for testing
January 21	Apply fertilizer to seed bed area	August 1	Start chopping pine straw for mulch
January 25	Quarterly requisition due in S.O.	August 1	Maintain cone sheds and extractory
January 25	Stratify pine seed	August 20	Send samples of other pine seed lots to Lab for tests by Sept. 1
January 25	Inform Regional Office through Supervisor's Office of any surplus seedlings no later than Feb. 1	August 25	Turn under Soil Crop
January 31	Make report on seed extracted	August 25	Have imprest funds cash on hand
February 25	Treat seed with bird repellent	August 28	Start receiving slash cones
March 1	Begin sowing	August 28	Check cone seed production
March 1	Begin mulching seed beds	August 28	Apply sawdust to next years seed bed area (Soil Crop Area)
March 1	Begin watering seed beds - if needed	Sept. 1	Miss. State University Soil Analysis to be made
March 15	Make seedling distribution report	Sept. 1	Apply nitrogen with sawdust
March 15	Begin spraying with Fermate	Sept. 1	Arrange to transport slash cones
March 15	Begin spraying with Mineral Spirits	Sept. 1	Start drying slash cones
April 1	Make report on seed used	Sept. 15	Disc soil crop area to encourage sprouting of weed and grass seed
April 15	Begin hand weeding	Sept. 15	Begin hardening off seedlings
April 15	Start side dressing	Sept. 15	Start testing longleaf and loblolly cones
April 20	Apply sawdust to soil crop area	Sept. 28	Arrange to transport longleaf and loblolly cones
April 20	Apply nitrogen to soil crop area	Sept. 30	Start receiving longleaf and loblolly cones
May 1	Seed Inventory and Cone Collection and Extension Report due in R.O.	Oct. 1	Sow fall cover crop
May 1	Sow soil crop	Oct. 1	Test seed production in longleaf and loblolly cones
May 1	Begin work on Annual Work Plan	Oct. 5	Start fall seedling inventory
May 15	Start cultivating soil crop	Oct. 25	Fall seedling inventory due in S.O.
June 1	Mow longleaf seed beds	Oct. 25	Install lifting blade on tractor
June 1	Mow nursery area	Oct. 25	Maintain grading tables and all packing equipment
June 1	Quarterly Requisition due in S.O.	Oct. 30	Test strapping machines
June 1	Haul sawdust	Nov. 1	Employ packing help
June 1	Make spring seedling inventory	Nov. 1	Fall inventory due in R.O.
June 20	Seedling inventory due in S.O.	Nov. 1	Treat seed with bird repellent for direct seeding
June 20	Discontinue use of Fermate for Cronattium	Nov. 10	Prepare seed beds for fall sowing
June 20	Spray longleaf every two weeks for brown spot	Nov. 15	Sow seed beds
July 1	Begin Annual Property Inventory	Nov. 20	Start lifting, packing and shipping seedlings
July 1	Start raking and hauling pine straw	Nov. 25	Turn under all cover crops on next years seed bed areas
July 1	Start any new construction jobs	Dec. 1	Quarterly requisition due in S.O.
July 1	Start nursery building and other maintenance work	Dec. 1	Stratify hardwood seed
July 1	Start preparing personnel performance ratings	Dec. 15	Prepare soil in seed bed areas for fumigation
July 10	Send strapping machines for factory repairs	Dec. 15	Form 2400-50 (3-yr. Estimate Reforestation-TSI Nurseries)
July 10	W.C.F. - Seed and Planting Stock Inventory due in R.O.		
July 15	Annual property inventory due in S.O.		

<sup>1</sup>This table is an example only - some pesticides are not currently registered for these uses.

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  1. Compartment sheets—records of seedling culture: sowing, spraying, weeding, irrigation,

etc. The Alabama Forestry Commission uses a very effective form designed by Carl Muller (figure 17-1). Cultural activities are color-coded and entered by date and location within the compartment.

- E. Seedling distribution
  1. Lifting and storage record
  2. Seedling shipment record
- F. Seedling inventory
  1. Life history plots
  2. Dug sample record
  3. Summer inventory
  4. Fall inventory
- G. Soil management
  1. Soil test reports
  2. Compartment charts—records of fertility levels, soil treatments and cover crops
- H. Equipment
  1. Truck and tractor operation—time or mileage distribution by projects.
  2. Truck and tractor—lubrication and service
  3. Fuel and oil use
  4. electricity meter reading
- I. Consumer stores
  1. Inventory of chemicals, fertilizers, shipping material and other supplies.
- J. Maintenance records
  1. Physical improvements
  2. Equipment
- K. Budget

Table 17-3. — Comparison of seedling costs.

Items	Percent of total cost		
	Nursery		
	A <sup>1/</sup>	B <sup>2/</sup>	C <sup>2/</sup>
Administration and operation	23.1	30.0	35.1
Seed	13.3	15.0	2.9
Wages			
Seeding	3.9		
Weeding, irrigation, pest control	15.6		
Seedling distribution	20.3		24.2
Soil preparation	1.0		
Nursery supplies			
Weed control	8.0	2.0	2.1
Disease and insect control			0.8
Fumigation		10.0	
Chemicals		2.0	
Fertilizer	0.3	2.0	
Mulch		1.0	
Soil management			7.9
Packaging material	1.6	2.0	3.3
Fuel	4.8	4.0	1.6
Electricity		1.0	2.0
Telephone			0.3
Miscellaneous supplies and equipment	0.3	1.0	0.1
Equipment maintenance	4.1	3.0	2.2
Building maintenance		2.0	8.4
Depreciation, taxes and insurance	3.7	25.0	9.1

<sup>1/</sup> Three-year average 1949-1952.

<sup>2/</sup> Industry nurseries-middle 1970's.

Administration and operations including wages for nurseries A and C, were 63.9 and 59.3 percent, respectively.

*Table 17-4. — Cost Accounting Categories*

- (1) **Tree seedling crop — land preparation**
  1. Plowing, tilling, land leveling and disking
  2. Soil sampling
  3. Fertilizing
  4. Preparing beds
- (2) **Tree seed preparation**
  1. Sampling
  2. Stratifying
  3. Seed coating — fungi and bird repellents
  4. Inventorying
  5. Extracting, cleaning and storing
- (3) **Tree seedling crop — seeding**
  1. Computing sowing rates
  2. Calibrating and sowing
  3. Mulching
- (4) **Irrigation — tree and cover crops**
  1. Installing portable sprinkler system — tree crop
  2. Installing portable sprinkler system — cover crop
  3. Watering — tree crop
  4. Watering — cover crop
  5. Maintaining and storing pipe and accessories
  6. Repairing motors, pumps, and wells
- (5) **Seedling crop — culture**
  1. Thinning stand
  2. Maintaining beds and middles
  3. Spraying — disease control
  4. Spraying — weed control — mineral spirits
  5. Spraying — weed control — chemical herbicides
  6. Weeding — hand labor
  7. Spraying — insect control
  8. Fertilizing — liquid and dry chemical applications
  9. Pruning — root and top
  10. Inspecting seedlings
- (6) **Seedling crop — inventorying**
  1. Office work
  2. Field work
- (7) **Seedling crop — harvesting**
  1. Lifting — machine
  2. Lifting — hand
- (8) **Seedling crop — processing**
  1. Grading and counting
  2. Grading and weighing
  3. Claying and bundling
  4. Transferring to cold storage
  5. Shipping
  6. Delivering
  7. Inspecting bale count, grade and condition
- (9) **Cover cropping**
  1. Plowing and tilling
  2. Mulching
  3. Land leveling
  4. Soil sampling
  5. Seeding
  6. Weeding — chemical herbicides
  7. Incorporating — mowing, disking and plowing
  8. Spraying — insect control
- (10) **Soil fumigation**
  1. Receiving and shipping materials
  2. Applying chemicals and plant bed covers
  3. Removing covers
- (11) **Equipment**
  1. Fabricating
  2. Modifying
  3. Maintaining — servicing
  4. Repairing — major work
- (12) **Buildings and grounds**
  1. Maintaining buildings
  2. Maintaining grounds — mowing, landscaping, and road grading
  3. Miscellaneous — fencing
- (13) **Research**
  1. Seedling crops
  2. Cover crops
  3. Equipment
  4. Outplanting
- (14) **Administration**
  1. Recording — time, nursery journal, property, precipitation, cultural treatments, reports to department head, outside correspondence, telephone
  2. Employing labor
  3. Purchasing procedures
  4. Confering with department head and nursery personnel
- (15) **Leave**
  1. Vacation
  2. Sick
  3. Holiday
- (16) **Other**
  1. Travel
  2. Tours
  3. Miscellaneous



DATE	MONTH _____	Mulch Removal	Compartment No _____	Fertile	REMARKS	PRECIP AMOUNT
	YEAR _____	Rain Planted		Mineral Spirite Irrigation		
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
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31						

Figure 17-1. — Record of cultural activities.

Source: Carl Muller, Alabama Forestry Commission.

## COMPUTER APPLICATIONS

The USDA Forest Service has recently developed a computer system titled Nursery Management Information System (NMIS) for use in Forest Service nurseries nationwide (Thatcher 1983). This system uses a TI 9990 micro-computer to store data on seed testing and use, seedling cultural activities, seedling inventories (Chapter 16), and seedling shipping records. NMIS also can generate reports and summaries from stored data (figures 17-2 and 17-3).

## SUMMARY

Forest tree nurseries are very intensive operations that require a high degree of technical knowledge and skill. Detailed planning is essential if production of quality seedlings is to be maintained. A nursery work plan is an efficient tool for budget and production planning and for training of staff. Accurate and complete cost accounting indicates the cost of producing seedlings and may reveal individual costs that are too high. Good permanent records are essential for monitoring the technical and financial efficiency of the nursery operations.

## REFERENCES

- Armson, K.A. and V. Sadreika. forest tree nursery soil management of related practices. Toronto, Ontario, Canada: Ministry of Natural Resources; 1979.
- Thatcher, Richard H. Computer use at Lucky Peak Nursery. In: Proceedings. 1982, southern nursery conference. Technical Publication R8-TP4. Atlanta GA: U.S. Department of Agriculture, Forest Service, Southern Region; 1983. p. 66-76.

The Nursery Management Information System's  
Relationship to Forest Service Activities

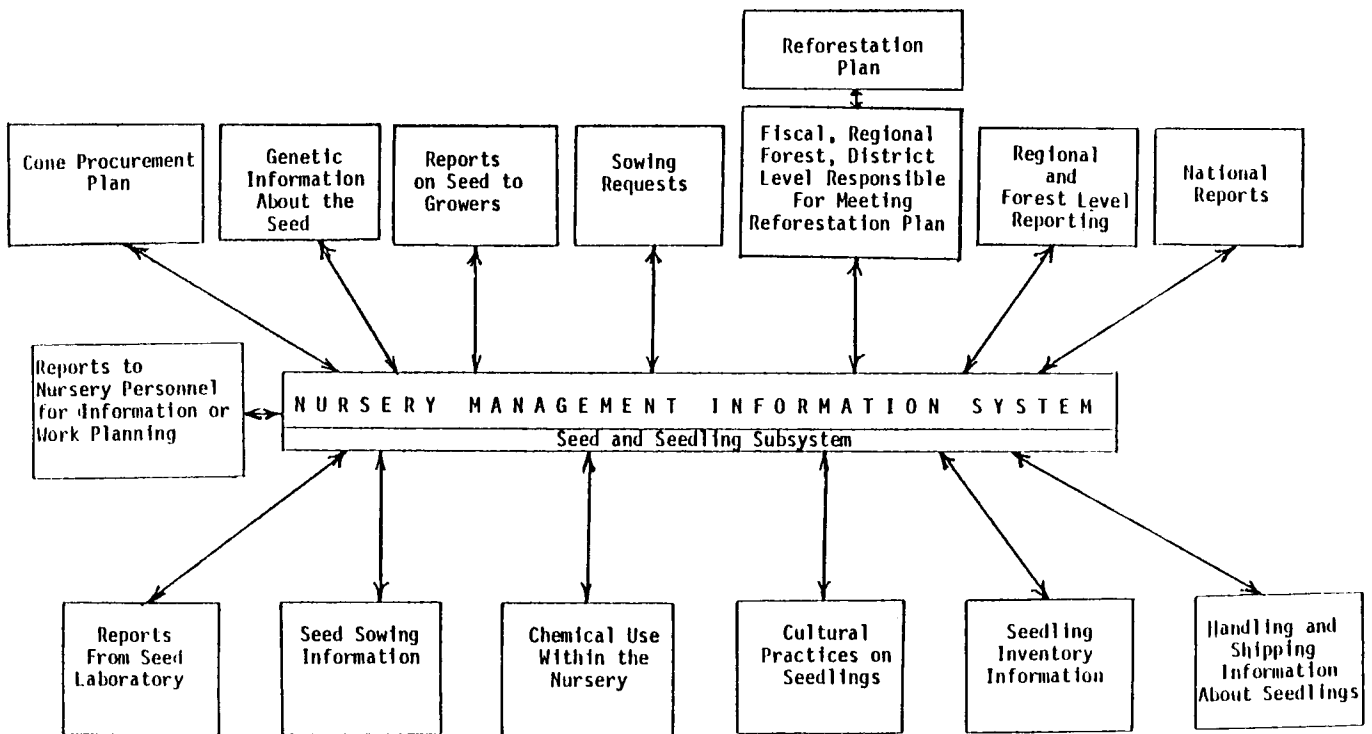
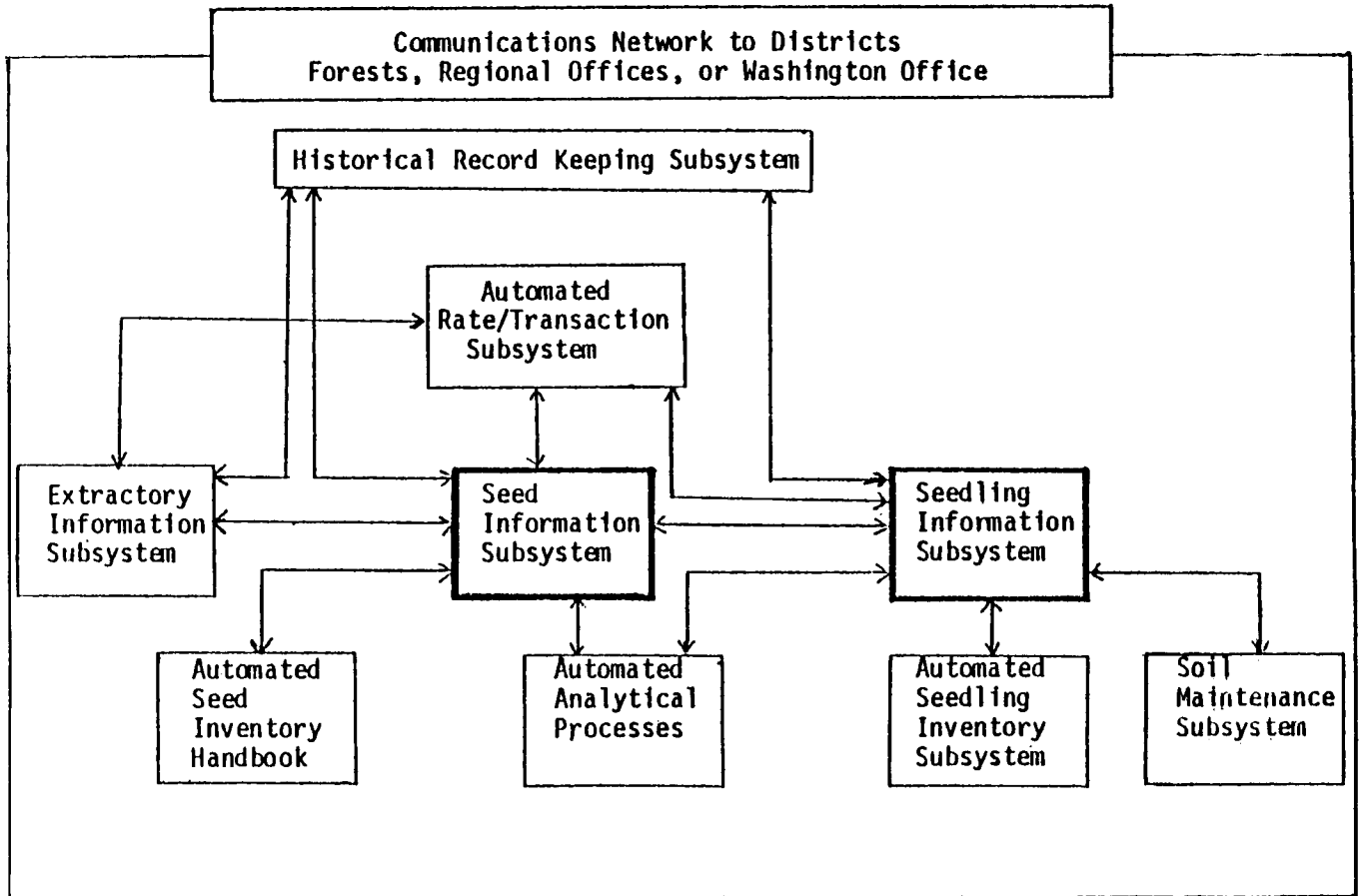


Figure 17-2. — Capabilities of the Nursery Management Information System.

THE NURSERY MANAGEMENT INFORMATION  
SYSTEMS INTERNAL RELATIONSHIPS



Those items in the dark boxes now exist in an automated fashion.

Figure 17-3. — NMIS — Internal Relationships.

## APPENDIX 17-1

### EXAMPLE OF COSTS, MATERIALS, PROCEDURES, AND WORK CALENDAR USED IN A NURSERY PLAN FOR THE CONTROL OF DISEASES AND INSECTS.

#### Fusiform Rust

Use Fermate or Ferbam (76 percent ferric dimethylthiocarbamate) to control *Cronartium fusiform*. (Compiler's note: Many southern nurseries use Bayleton for fusiform rust control; see chapter 13.)

For all pine seeds sown in March and April, begin spraying to control this disease as soon as germination starts. There is danger of infection as soon as the spores mature on oak leaves in the spring.

Spraying may usually be discontinued by the end of June. At this time, weather conditions are not usually favorable for infection and spore development may have stopped.

Use a high-pressure sprayer to apply the chemical. Operate the sprayer at a pressure of 350 psi or more. Use this formula for the spray mix:

	<u>Tankful</u>	<u>Compartment</u>
Fermate	2 lb	13-1/2 lb
Water	100 gal	6,750 gal
Santomerse SX	2/3 pint	4-1/2 pints
TH sticker	1.5 lb	9 lb

One worker can spray three compartments in 8 hours, including the time needed to mix materials.

<u>Number of sprays per month</u>			
<u>April</u>	<u>May</u>	<u>June</u>	<u>Total</u>
4	9	8	21

#### Estimate

Basic: Per compartment

WB-6 worker . . . . .8-1/2 days (compute below)

S & M Fermate . . . . .283 pounds

Santomerse SX . . . . .21 pints

TH Sticker . . . . .45 pounds

#### Pales Weevil

Loblolly pine seedlings will be planted at the Hagerville Fire Area on the Neches District. An Aldrin dip is advisable to prevent an attack by pales weevils within this wildfire area. Dip the pine seedlings in the Aldrin solution held in a homemade vat, which was built out of a 55-gallon oil drum cut longitudinally in half.

Use a Du Pont spreader sticker in the solution, at the rate of 18 drops per 3 gallons of mixture. Dilute the Aldrin with water at the rate of 3 gallons per quart of Aldrin. Treat the seedlings in units of about 25 to 50 seedlings per bunch. Dip the tops of the seedlings bunches in the solution to within, and including, the root collar. Wear rubber gloves during this work. Dip the seedlings on the same date on which they are to be planted, or not more than one day earlier.

The Aldrin costs \$3.36 per gallon; use 16 gallons to treat 100,000 seedlings. Use 1 pint of Du Pont spreader sticker, at a cost of \$1.68 per pint (including postage). The total cost of dipping the 100,000 seedlings is \$53.76, or about \$0.54 per thousand, plus labor costs. About 15 minutes per thousand seedlings should be figured for dipping. At \$1.20 per hour, the total labor cost of treatment is \$0.84 per thousand seedlings. (Compiler's note: This procedure is included as an example only; Aldrin is no longer registered for this use.)

## APPENDIX 17-2

### EXAMPLE OF PROCEDURES, MATERIALS AND LABOR CALCULATIONS USED IN A NURSERY PLAN FOR PACKING AND DISTRIBUTING SEEDLINGS

#### Assemble Materials

Have all packing materials on hand by November 1.

1. Sphagnum moss—Buy on open-market bid. Use bales about 13 × 19 × 31 inches, and equal to about 5 bushels of wet moss.
2. Stakes—Size 1 × 2 × 24 inches
3. Wrapping material
  - A. Paper-lined burlap—use for shipments going by railway express or motor freight.
  - B. Waterproof paper—use for truckload shipments.<sup>1</sup>
  - C. Plastic bags—preferred by Y-LT Project.
4. Binding material—Signode steel strapping, .015 × 3/8 inch. Seals used are Signode Number 38AC.

<sup>1</sup>For cypress, use material 36 inches wide.

#### Distribution

*Materials needed per million seedling<sup>1</sup>*

Item	Std. FS bale	Plastic bags
1. Sphagnum moss (bales)	120	90
2. Wooden stakes	1,000	1,000 <sup>2</sup>
3. Wrapping material	1,000 yards	1,000 bags
4. Binding material (pounds)	85	85
5. Seals, Signode No. 38AC	1,500	100-120
6. Clay, 50-pound bags	_____	

<sup>1</sup>Bind cottonwood cuttings with baler twine. Do not use moss or a wrapper. Keep all cuttings oriented in the same direction, i.e., all butt ends together.

<sup>2</sup>The need for wooden stakes is questionable. Too often, the sharp corners puncture the bags.

## APPENDIX 17-3

### EXAMPLE OF PROCEDURES, MATERIALS, EQUIPMENT, AND LABOR CALCULATIONS USED IN A NURSERY PLAN TO MAINTAIN HIGH SOIL FERTILITY

#### Turn Under Summer Cover Crop

The summer cover crop will be turned under in late August or early September, depending on its maturity and the next treatment to be given the soil. If the area is to be fall sown for seedlings or fumigated with Methyl bromide, the cover crop must be completely decomposed to permit further preparation of the soil. Methyl bromide will concentrate in undecomposed vegetation and will be lost as a fumigant.

Cut the cover crop with a bush-hog, followed by double disking. Then go over the area with a turning plow and let the beds lie idle until examination show that decomposition is complete.

Cut sample plots to determine the weight of green material produced per acre before starting any work on the plowed beds.

recognized. Plants assume a characteristic yellow color and show a general lack of thrift. Applications will be light enough to avoid burning plants and will be repeated at intervals of 7 to 10 days until thrift and color are restored.

Tons per Acre <i>(Oven dry weight)</i>	Depth <i>(inches)</i>	Cubic yards <u>Per acre</u>
10	1/2	67
15	3/4	100
20	1	134
25	1-1/4	168
30	1-1/2	201

Weight of 1 cubic yard of sawdust with average moisture content: 933 pounds.

<u>Estimate</u>
Basis: Per compartment
WB-6 worker . . . . . 3 work days (8 hours per day)
WB-3 worker . . . . . 3 work days (8 hours per day)
EO & R tractor . . . 16 hours
(WB = Wage Board, employee, grades 6 or 3; a personnel classification system)

<u>Estimate</u>
Basis: 10 tons per acre applied by manure spreader
WB-6 Worker . . . . . 4 MD
Nursery worker . . . . . 4 MD
Laborer II . . . . . 2 MD
EO & R tractor w/loader . . . . . 30 hours
Truck stakes . . . . . 1,125,000

#### SAWDUST

Sawdust improves the physical condition of the soil and increases the organic content. Packing and crusting are lessened. Root rot is less prevalent when seedlings are grown on soil enriched by sawdust.

Apply sawdust during the cover-crop phase of the rotation to permit enough time for it to break down before the seedling crop is sown. Disk it in before the spring crop. The amount applied will be governed by the needs of the particular area, the availability of funds for this purpose, and the supply of sawdust to be found within a reasonable distance from the nursery.

Decomposition of sawdust in the soil places a heavy drain on available nitrogen. Correct this condition by side-dressing with ammonium nitrate as soon as the crop shows evidence of nitrogen starvation. The symptoms are easily

The recommended organic content for nursery soil is 2 percent. Satisfactory seedling crops can be produced on soils varying from 1 to 4 percent in organic matter. Soils with a higher organic content are associated with seedling diseases, fertilization problems and insect infestations.

**Sawdust Applications.**—The present practice is to apply 20 tons; 1 inch; or 134 Cu. yards per acre. Spread the sawdust in compartments to be sown to seedlings the second consecutive year. In compartments to be sown to a summer cover crop, apply 30 tons, 1-1/2 inches or 201 cubic yards per acre. Because of the extra need for nitrogen, add 150 pounds of 33-percent ammonium nitrate for the 20-ton rate of sawdust mentioned above. Disc the nitrogen into the soil with the sawdust. On the seedbed area mentioned, apply the sawdust as soon as possible after lifting the seedlings. On the cover crop areas, apply the sawdust before sowing the soil crop. Use the IHC No. 40 manure spreader, loaded with the IHC lift attachment.