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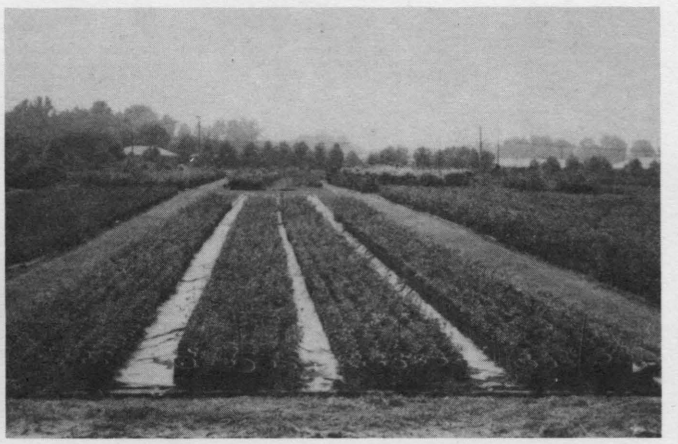
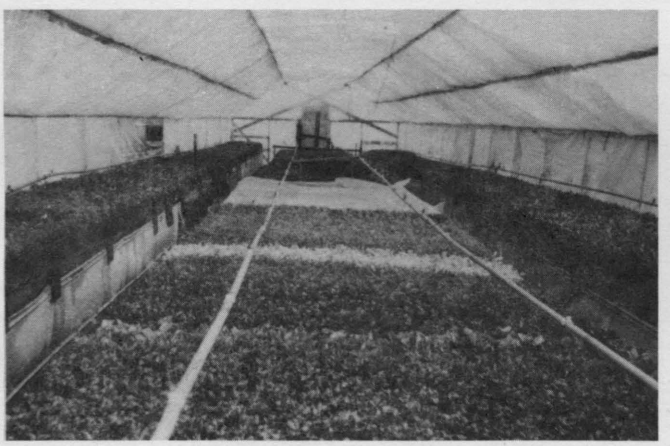


STARTING A NURSERY BUSINESS IN VIRGINIA

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Growing Nursery Stock - Is It For Me? by Wilbur L. Bluhm and James L. Green. February 1979. 56 pages. Extension Manual 5, Oregon State University Extension Service.

Starting a Wholesale Nursery Business by D. L. Ingram, J. T. Midcap, and D. L. Gunter. 1980. 8 pages. Circular 409A, Florida Cooperative Extension Service.

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STARTING A NURSERY BUSINESS IN VIRGINIA

by
Paul L. Smeal and James S. Coartney[1]

INTRODUCTION

Each year we receive a number of inquiries from individuals who are interested in starting a nursery business. This interest starts with the pleasure that they have received from growing plants as a hobby; or they have money from another source that has been used to buy a piece of land and they now are seeking information as to how to do something with the land. Through the Virginia Cooperative Extension Service, we have held a number of short courses for such individuals. Some are now established, successful nurserymen, and some others tried and failed or decided not to start a nursery business. Success comes only as the result of doing many things correctly. Failure comes easily.

This publication is designed to assist individuals who are contemplating the establishment of a nursery enterprise. It will encourage some and discourage others, but allow each to make more rational decisions.

First of all, any individual who contemplates starting a nursery enterprise should determine answers to these questions.

1. Is there need for increased nursery production in Virginia?
2. Where will I sell my plants?
3. What do I need in the way of land, buildings, and equipment?
4. How much investment capitol is needed, and how long before I can expect to see a profit?
5. How much do I need to know about growing plants, and how do I know what plants to grow?
6. What sort of location is needed to grow plants?
7. What legal requirements must be met to become a nurseryman?
8. What are the risks involved?
9. How much work is involved?
10. How will it affect my life style?

The following text will help such individuals answer these questions and the many other more specific questions they will have about plant production, legal structure, and financing. It also directs them toward other sources of information that are more detailed.

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[1] Respectively: Extension Horticulturist, Nursery Production, and Professor of Horticulture; and Associate Professor of Horticulture; Department of Horticulture, College of Agriculture and Life Sciences, Virginia Polytechnic Institute and State University.

THE NURSERY INDUSTRY

The nursery industry is an alliance of many diverse but interrelated businesses. It includes individuals or firms that produce plants, retail firms that sell plants, and landscape firms that install plants to form attractive and functional landscape plantings. The first production nursery is reported to have started on Long Island in 1837. Today's nursery industry is a billion-dollar industry that ranges from hobbyists to corporate giants.

Because of this diversity, defining what is meant by the term "nursery" or "nurseryman" becomes difficult. Later, under the section that deals with rules and regulations, you will be given the legal definition included in the Code of Virginia. As a working definition, we will merely define it as any individual or firm involved with the production or sales of woody plant material for landscape use. Every nursery is unique. Some producers grow in field rows, others in containers, others in high density beds. Some sell only wholesale, some only retail, while others may be involved in wholesaling, retailing, and landscaping.

The type of nursery that you develop will be a reflection of your personality, your resources, and your potential market.

National

Nationally, the nursery industry is estimated to have annual sales of 2.5 billion dollars. This figure is wholesale production and would multiply as it goes to retail and landscape. Based on a 1984 Nursery Business (trade magazine) survey, Virginia ranks 24th with annual wholesale production of 25 million dollars (see Table 1). These figures are based on wholesale production of woody plants and do not include the allied florist and foliage plant industries.

Regional and State

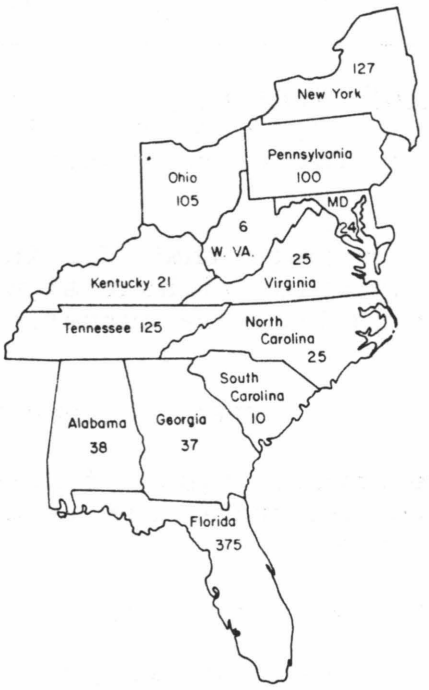
Figure 1, prepared from the 1983 Nursery Business survey figures, shows nursery production dollar values for Virginia and its neighboring states. It is particularly interesting to note that Tennessee has a production level 3 times greater than Virginia. The soils and climate in Virginia are equally or better suited to nursery production than those in Tennessee, and Virginia has the additional advantage of closer proximity to major metropolitan markets.

Table 1. Sales Figures for the Top 10 Nursery States*

	State production Mil $	Total Acres	Total Nurseries
California	$395.0	15,000	1,900
Florida	$375.0	16,000	2,300
Texas	$175.0	7,000	700
New York	$127.0	8,800	1,506
Tennessee	$125.0	12,000	661
Oregon	$120.0	12,000	1,489
New Jersey	$112.0	8,000	1,023
Ohio	$105.0	8,700	1,109
Michigan	$103.0	10,000	1,540
Pennsylvania	$100.0	10,500	999

*Nursery Business, September 1984, Vol. 29, No. 9.

Figure 1.



According to Virginia Department of Agriculture and Consumer Services figures presented in Table 2, you will see that acres of nursery production, numbers of producers, and numbers of dealers has remained rather constant over the last several years. During this same period, the demand for nursery stock in Virginia has continued to increase. Present estimates indicate that 75% of the nursery stock retailed in Virginia is imported from out-of-state, and a high proportion is supplied from states as far away as California and Oregon. Retailers in Virginia tell us that they would prefer to buy Virginia-grown nursery stock if it were available at comparable quality and price.

Table 2. Number of nurseries, acreage, and dealers in Virginia.*

Year	Registered Nurseries Number	Acreage	Dealers Number
1986	452	10,070	1,680
1985	560	9,411	1,738
1984	439	10,298	1,523
1983	563	10,761	1,784
1982	513	9,662	1,554
1981	484	9,634	1,412
1980	524	9,580	1,449
1979	497	10,667	1,439
1978	552	10,934	1,439
1977	555	10,711	1,459
1976	560	11,163	1,464
1975	505	11,689	1,514
1974	585	10,825	1,454

*From Directory of Nurserymen and Dealers Registered to Sell Nursery Stock in Virginia. Virginia Department of Agriculture and Consumer Services (for years listed).

This information suggests that Virginia could significantly increase nursery production without significantly increasing competition from existing Virginia nurseries.

TYPES OF NURSERIES

Because there are several types of nursery operations, one of the first steps is to determine the type of nursery that fits your desires and resources.

- Retail: retail business only, with no growing area.
- Grower/retail nursery: usually a retail outlet plus sufficient acreage for growing.
- Wholesale nursery: grows plants for sale to other nurserymen, landscape contractors, or retail outlets. Wholesale nurserymen may also grow plants on a contract basis.
- Landscape nursery: provides landscape services and retail sales as well as producing plants.
- Garden center: provides a wide variety of plants, equipment, and related supplies. May also offer landscaping and other services, but does not produce plants.

- Plant broker: collects and holds plants from many areas for sale to retail nurseries, or a salesman for other nurseries.

- Custom digger/plant collector: digs plants bought from growers or digs native plants to supply the landscape markets.

OPPORTUNITIES FOR PART-TIME OR FULL-TIME NURSERIES

A Hobby or a Business

Individuals are often lured into the nursery business because they have a hobby of growing plants. If you are serious about plants as a business, you may very well have to give up your hobby. The Internal Revenue Service takes a dim view of the "hobbyist". They use the guide of "reasonable expectation of profit" in deciding if your operation is a hobby or a business. If it is a hobby, you cannot deduct expenses and are expected to pay for your pleasure with after-tax dollars. If you make the decision to operate a legitimate business, your goal should be to maximize profit/net worth.

Part-time Nursery

The term "part-time" is applied to a nursery operation where the operator has another principal occupation and spends less than full-time with the nursery operation. Part-time nurseries are common within a small-city trading area that lacks the sales potential to support a full-time operation. In this case, the absence of competition from other firms increases the feasible range of price markups. There is also the opportunity for small part-time operations around urban areas. In this case, the grower will often specialize in growing a small number of items and become the local supplier for those items.

Full-time Nursery

A full-time nursery is one that has one or more persons working full-time at the nursery. For field production, this would probably involve ten or more acres of nursery stock; for container or seedling production, it might be significantly less. Many of Virginia's full-time nurseries are located near large cities, but there are also large full-time nurseries located in rural areas. Those in rural areas are likely to be wholesale operations. Improved highways have made it feasible for producers to be located farther from markets.

Nature of the Work

Producing and marketing nursery stock differs considerably from other agricultural crops. Production schedules, practices, type of work, risks and hazards, and financing of the operations all differ. Each plant has unique requirements. Many plants must grow for several years before they reach the desired market size.

Successful nurserymen have an interest in plants, enjoy outdoor work, and like people. They are willing to work long, hard hours and to assume responsibility. Imagination, initiative, marketing ability, good business management, good judgment, and common sense are necessary attributes that enable them to build businesses that are financially successful.

Learn as much as possible about similar operations before you start. Visit nurseries in your area, particularly of the type you would like to start. Most nursery growers are willing to share ideas and discuss common problems with others in the trade. This approach usually leads to increased sales rather than increased competition. Growers also work together on industry concerns to support the industry's causes.

Many physical, "how-to-do" skills are required for growing various types of stock. These include taking and sticking cuttings, budding and grafting, potting and canning, pruning and training, fertilization, and spraying. Heavy physical labor may be required to handle soil, dig and ball plants, lift and move containers, lift heavy fertilizer bags and spray equipment and construct plantings. By specializing in a particular type of operation, one can become extremely efficient and may not need to be involved in all facets of production.

A knowledge of plumbing, electrical wiring, carpentry, welding and mechanics is very useful, because you can save money by doing your own construction and repairs. You can also save on labor costs if you are able to design and build specialized equipment.

Nursery operations are quite diverse and generally much less mechanized than agronomic crops. A great deal of manual labor is required to perform specialized operations such as digging or potting plants. Opportunities to mechanize and reduce manual labor are unlimited. There are potting and canning equipment and tree diggers, but one has to have sufficient volume to justify owning the equipment.

The nursery business can be entered with limited know-how, but one must soon become familiar with growth habits and cultural requirements of the plants. A nurseryman must acquire knowledge of soils, nutrition, irrigation, pruning and shaping, pest control, nursery production techniques, sales, and business management. Specific nursery crops may require an in-depth understanding of propagation, production practices, and other special needs or techniques related to those crops.

The value of obtaining knowledge and experience cannot be overemphasized. Acquaint yourself before making any basic but costly decisions. One of the best ways to learn is to find employment at a nursery. There is much satisfaction in offering attractive, well-grown plants, and in having satisfied customers, plus the potential for profit.

Patience and perseverance are required to grow nursery stock because it takes four years or more to develop young plants into ornamentals suited to landscaping, and may take from 2 to 20 years to show a profit. You must invest a substantial capital outlay before your business will provide a living. It may take 5 to 10 years before the nursery breaks even. During the early years, there is strong demand to put the earnings back into the business. Unless you are willing to wait five or more years for a return on your investment, you should not start a nursery.

Environmental problems such as frost, freeze, ice, flood, wind, hail, and snow can occur and are not normally covered by insurance. Equipment failure, noxious weeds, insect or disease outbreaks, loss of key personnel, cancelled orders, no payment or slow payment, or other unexpected happenings can disrupt the entire operation. Such problems may not be frequent, but in the early stages they can be catastrophic. Unless you can handle such adversity, the nursery business is not for you.

Growing nursery stock demands more labor during some seasons than others. Peak labor periods vary with different types of nursery businesses. Most nursery field work is in the spring, summer, and fall. In winter or when the weather is disagreeable, efforts can be concentrated on greenhouse propagation. It is often necessary to work in the cold wind or rain of winter, and during the hottest, most humid days of summer.

Spring is a busy or hectic time because plants grow rapidly and problems are more prevalent. It is time to dig and sell field-grown stock, and everyone wants it at once. Liners need to be planted in the field or containers. Fertilizing, cultivating, pruning and training stock, shipping late orders, and controlling weeds, insects, and diseases all need attention during this period.

Summer requires irrigation for plant survival, especially container-grown stock and broadleaf evergreens. During late spring, summer, and fall, cuttings are taken and some plants may require pruning, and weeds, insects, and diseases must be controlled constantly. Summer is a busy time, but it is also the time to attend nurserymen's conventions, trade shows, nursery tours, and take vacations.

Fall ends the growing season, but is the start of another busy time when you must dig and market field stock, place stock into holding beds or houses to store them for early spring shipments, and protect container-grown plants from the coming winter cold. It is also the time to collect and process seed for your own use or sale, propagate conifer cuttings, and apply herbicides for next year's weed control.

Winter activities include digging, marketing, holding and storing, and shipping. Taking and sticking cuttings, planting seeds, and grafting trees and shrubs are winter jobs that often continue into

spring. This is a good time to overhaul and see that all machinery is ready for spring. Also, chemicals, fertilizers, and supplies must be ordered. Nurserymen's short courses, conventions, and trade shows are usually held in the winter.

Risks and Hazards

Weather, weeds, and insects and diseases, the economy, a perishable product, and an anticipated market pose major risks for Virginia nursery growers.

Sub-zero temperatures cause severe damage to field and container-grown plants and plants in the landscape, especially the broadleaf evergreens. Late spring frosts kill tips of new growth, slow growth, and may deform plants, reducing their quality or making them unsalable. Early fall freezes may kill flower buds on azaleas and rhododendrons, and split the bark on azaleas and boxwoods. Ice, wind, hail, and snow can be mechanically destructive by breaking branches.

Weeds present a never-ending battle. A noxious weed infestation, such as wiregrass or mugwort, may cause plants to be unsalable or require costly digging and cleaning of plant roots before selling. Hand weeding is costly, but is often necessary with container and bed-grown field stock. Weeds also compete with plants for moisture and nutrients and slow growth of ornamental plants.

Water is a must, especially when growing evergreen plants. A water failure in summer can be disatrous. If the irrigation pond, stream, spring, or well goes dry, plant loss can be severe. Sudden, unexpected heat may push the irrigation system beyond its capacity and cause serious problems or complete loss. A mechanical problem with a pump or motor can be equally destructive. Of course, they only break when you are using them.

The market can be unpredictable because it can be influenced by the economy, people's tastes, and by weather conditions in the marketing area.

The national and state economies, as they prosper or decline, influence the nursery and ornamental horticulture market. Wages and unemployment regulate the consumer's buying power. Housing starts and other construction provide important outlets. National, state, and local governmental policies involving housing, highway, construction, beautification and scenic programs, energy, the economy, and other issues can significantly affect the demand for nursery stock. Historically, the nursery business has been rather recession-proof, showing a leveling trend when other segments of the economy have taken severe downturns. Small container plants are more likely to reflect the state of the economy than the larger field-grown plants.

People's tastes for plants change, just as their tastes for clothes and cars change. The grower must anticipate these

changes; and, as a result, must often decide what to grow several years in advance. New growers tend to grow plants that remain popular year-after-year, the bread-and-butter plants, which may add to over-supply and reduced profits.

Nursery stock that has no market at maturity must be discarded and the land cleared for a new crop. The original investment is now a loss, and the grower has the added expense of removing and discarding the stock. Nursery stock may not be as perishable as flowers, fruits, or vegetables; but, if it isn't sold, it will be a loss.

Sound management, marketing, and production practices will enable most growers to minimize risks and hazards. While you have little or no control over the economy or people's tastes or life-styles, you can reduce risk through proper plant selection, good site location, good pest and cultural management, and sound market development.

GETTING STARTED IN THE NURSERY BUSINESS

If you enjoy and have experience growing plants, perhaps fruits and vegetables, you may believe it would be easy for you to start a nursery. But getting started in the nursery production business is not easy, and it is not without financial investments and risks. You must have a suitable location with water, equipment, and buildings. You must decide what stock you'll grow, how to price and market that stock, and what production methods to use. And lastly, you must have the financial resources to carry the operation until it becomes profitable.

Deciding What to Grow

What plants to grow is a most perplexing question for the new grower. Without experience or knowledge of the retail nursery industry, you probably don't know which plants the market wants. This question is not easily answered. You must eventually find the answer for yourself. Grow those plants for which there is a potential market, that are well suited to your site, and that suit your interests and expertise.

Here are items to think about:

- Consider what natural advantages you may have for growing certain plants. Location, water supply, knowledge and experience, available money, sunlight or natural shade, and plants you now have are all important.

- Grow plants that will be hardy in the area you plan to market; plants that will be hardy enough to tolerate the temperature extremes of your location without your having to provide impractical protection. There are various references (see Appendix D) that provide plant hardiness information. Observing

what is grown in local landscapes and consulting with other growers will also give clues on plant hardiness. Many books and nursery catalogs list hardiness ratings for ornamental plants. Keep in mind that these are relative values and that plant hardiness varies considerably, depending on how plants are handled and the particular microenvironment where they are growing within the hardiness zone.

- Select plants suited to the soil, water supply, and other physical limitations of your property; for example, sandy soil is suitable for shrubs with fibrous roots but not suited to shade tree production.

Table 3. USDA and Arnold Arboretum Plant Hardiness Zones. (Average annual minimum temperature for each zone)*

Zone	Temperature (F°)	
	USDA	Arnold Arboretum
1	> -50°	> -50°
2	-50 to -40°	-50 to -35°
3	-40 to -30°	-35 to -20°
4	-30 to -20°	-20 to -10°
5	-20 to -10°	-10 to - 5°
6	-10 to 0°	- 5 to 5°
7	0 to 10°	5 to 10°
8	10 to 20°	10 to 20°
9	20 to 30°	20 to 30°
10	30 to 40°	30 to 40°

*According to the USDA scale, Virginia includes zones 6-8, but the Arnold Arboretum scale places Virginia in zones 5-8.

- Avoid plants that are losing their popularity, going out of favor or style; for example, older crabapple varieties that are susceptible to disease. Become familiar with the plants that are now in greatest use and demand (see Table 4, for example). Determine the preferred sizes, foliage colors, textures, densities, formal and informal plant forms, dense or open habits, shapes, and branch structures; and the preferences for foliage vs. flowering vs. fruiting plants.

- Select and grow plants that will return a profit to you, either through production in volume or with an adequate margin between cost and selling price, or both. Not all plants have the same potential in all nursery operations. Some growers can produce a given plant profitabily due to volume, location,

land costs, climate, production methods, or any of a variety of reasons, while other growers cannot.

- Grow plants that are suited to your facilities and your financial capability. Japanese hollies or azaleas might appear to be a suitable crop for you, but another crop may be better if their production does not require a greenhouse or shade house. If your soil has marginal drainage, it is not suitable for production of Japanese hollies and azaleas but may be suitable for flowering shrubs or junipers.

Table 4. Top 10 shade trees selected by members of the National Landscape Nurserymen's Association (NLNA). Listed in order of preference.[1]

	Shade trees		Flowering trees	
Ranking	1982	1976	1970	1956
1	Red Maple	Norway Maple	Pin Oak	Pin Oak
2	Sugar Maple	Ash	Red Maple	Sugar Maple
3	Honeylocust	Sugar Maple	Honeylocust	Honeylocust
4	Ash	Red Maple	Sugar Maple	Silver Maple
5	Pin Oak	Linden	Red Oak	Sweet Gum
6	Linden	Honeylocust	Linden	Norway Maple
7	Norway Maple	Pin Oak	Ash	Red Maple
8	Red Oak	Red Oak	Norway Maple	Sycamore
9	River Birch	Sweet Gum	Sweet Gum	White Birch
10	Sweet Gum	Sycamore	White Birch	American Elm

[1]From a copy of American Nurseryman 131(94). Additional trees for Virginia are in Virginia Cooperative Extension Service Publication 430-597, February 1987, Shade, Flowering, and Evergreen Trees for Virginia.

- Avoid plants that have a cheap image, largely due to traditional mass merchandising policies. Production costs for a 1 gal juniper may be nearly as great as for a 1 gal rhododendron. The juniper has a cheap image while the rhododendron has an expensive image. Learn which plants have a cheap image and realize that they have to be produced efficiently in a large volume to realize a profit.

- Consider new cultivars or new plants that are generally not available in your market area. Trade magazines will alert you to new cultivars. Care is necessary in selecting plants or cultivars that have appeal and market potential.

- Avoid plants known to be difficult to grow or transplant, or which are susceptible to diseases and insects. They are more costly to produce, and they won't make your customers happy either.

Table 5. Top 10 flowering trees selected by National Landscape Nurserymen's Association Members (NLNA). (Listed in order of preference.)[1]

Ranking	1982	1976	1970	1956
1	Crabapple	Crabapple	Crabapple	Crabapple
2	Callery Pear	Hawthorne	Dogwood	Redbud
3	Hawthorne	Dogwood	Hawthorne	Magnolia
4	Dogwood	Flw. Cherry	Redbud	Hawthorne
5	Redbud	Callery Pear	Magnolia	Dogwood
6	Flw. Cherry	Flw. Plum	Flw. Cherry	Flw. Cherry
7	Amelanchier	Redbud	Flw. Plum	Flw. Plum
8	Flw. Plum	Saucer Magnolia	Mountain Ash	Tree Lilac
9	Saucer Magnolia	Crepe Myrtle	Callery Pear	Amelanchier
10	Golden Rain	Amelanchier	Amelanchier	Mountain Ash

[1]From a copy of American Nurseryman 131(94). Additional trees for Virginia are in Virginia Cooperative Extension Service Publication 430-597, February 1987, Shade, Flowering, and Evergreen Trees for Virginia.

- Consider complementing your offering of less commonly grown stock with the more common or popular plants. The more common or popular plants are the "bread and butter" crop for many growers. They may not provide the high return of the less common plants, but may provide stability to your marketing program and reduce risk due to their volume of use.

- Grow plants you like. It makes things easier when you are excited about what you grow.

- Grow plants you dislike - but are in demand. This contradicts the previous statement, but in Northern and Tidewater Virginia there is a rapid turnover of homeowners, and these people are looking for instant landscapes with fast-growing trees and shrubs. For example, silver maple is a fast growing, low-quality shade tree, but thousands are sold because they grow rapidly and provide a homeowner with instant shade.

Garden center managers, plant buyers, and landscapers can give you ideas about what to grow. However, be cautious; their advice may be biased, and they may be overly enthusiastic about having a new grower enter the business and compete with their present suppliers of nursery stock. You may also find that existing nurserymen offer pessimistic advice because they fear increased competition. However, here are suggested sources of advice and ideas:

- Operators of retail nurseries, garden centers, and roadside markets. Find out which plants are in demand and which plants

are in short supply; especially which plants will be in demand in 2 to 5 years when your first crop will be ready to market. Note the kinds of plants they have in stock, the prices, and how they are displayed and cared for.

- Landscape architects and landscape designers. Which plants are they using in their designs? Are there some plants they would like to use if available? What is the present trend and future trend in plant usage and popularity?

- Nursery growers. These individuals provide plant materials for all others. They have a good sense of what is in demand and what may be wanted in the future. Few nurseries can successfully grow a full line of plants for the landscape trade, but most are knowledgeable on what the trade is using.

- Nursery stock brokers. There are few brokers in marketing nursery stock, but they provide a very useful service to the grower and the trade. Large nurseries often function as brokers when they get orders greater than their existing production, they will buy from smaller nurseries at discount prices.

- Nursery and greenhouse suppliers. These people are in close contact with growers, garden centers, and the nursery trade. Some have field staffs or salemen calling on growers and the trade. The health of their businesses is related to that of their clients. Because they have the opportunity to visit may operations, they have a knowledge of the industry that can be useful in making decisions about what plants to grow.

- Nursery trade shows, conferences, and short courses provide excellent opportunities to see what plants are being sold, and to meet other growers and buyers. While attending a trade show, you can gather many nursery and supply catalogs. You will also be able to sense the pulse of the industry.

- Trade magazines. By looking at the advertisements and the prices for particular items, you can determine what is in demand.

- State Extension Horticulturists and local Extension Agents-Agriculture, especially those in highly populated or urban areas, are knowledgeable of popular plant items.

- Public gardens, parks, and arboreta. Virginia has many public gardens, arboreta, and university campuses that provide visual displays of ornamental plants. Public facilities like the Norfolk Botanical Gardens, the Virginia Truck and Ornamentals Research Station Arboretum at Virginia Beach, the Arboretum at the Virginia Tech Horticulture Research Farm south of Blacksburg, and the U.S. National Arboretum at Washington, DC. Blandy Farm and Colonial Williamsburg are enjoyable places to visit and see plants with names attached.

Call, visit, or write as many firms or persons as possible in each group to get more ideas. The telephone directory yellow pages, especially in urban communities, will list wholesale and retail nurseries, garden centers, landscape architects, designers, and contractors.

These people can give many useful ideas and guidelines on what to grow. You will need to evaluate and decide the ideas and guidelines suitable to use. The most popular plants may not necessarily be the best ones for you to grow. If they are popularly grown, they may be in adequate supply and may not offer the profit potential of other plants. Cheap image plants can be identified by visiting discount retail nurseries, garden centers, nursery growers, or by reading wholesale and retail advertisements.

Specialization vs. Diversification

Should you grow only one kind of plant, a few kinds, or an assortment of plants? There are advantages and disadvantages to each choice.

A specialized grower has the advantage of becoming an expert in all phases of producing and marketing a specialized line of plants. This allows development of a favorable reputation as a grower of a certain plant, and will allow you to direct your attention to the plant or plants that you most enjoy growing. Most importantly, you develop the expertise to grow high-quality plants that are competitive in the market. It is always easier to sell a high-quality plant than a low-quality plant.

Specialization is usually a less costly way to start a nursery business because you can:

- standardize methods and materials,
- reduce costs of equipment, chemicals, fertilizer, structures, and labor, and
- simplify production methods, marketing systems, and the required range of knowledge.

Specialization allows small growers to compete more readily with larger nursery operations. The small grower is more likely to be growing a particular plant in sufficient quantity to fill buyer orders. Also, the small grower will normally be selling locally, which allows same-day or overnight delivery except during peak spring and fall demand.

The disadvantages of specialization are the advantages of diversification. If the market for the specialty plant(s) becomes "glutted or soft", the specialty grower has nothing to compensate for slack sales.

Another disadvantage of specialization is if an insect or disease infestation or a natural disaster strikes your nursery, there are no other resistant or immune plants to carry you through. The diversified grower has a certain amount of risk insurance through the broader offering of plants.

There may be different markets for the specialized and diversified growers. Landscape contractors prefer to get as many plants as possible from a single grower for convenience and to save time and costs. The diversified grower has more markets available if for no other reason than the large variety of plants available for sale. This could be important to the new grower. Yet, most buyers respect and appreciate the unique service and quality of plant material offered by the specialized grower.

The specialized grower can, to a degree, diversify by offering a number of different cultivars within the specialty. The rhododendron and/or azalea grower may provide a wide assortment of cultivars not available through garden centers. Among the hundreds of rhododendron/azalea cultivars are great differences in plant form, blossom color and type, resistance to insects and diseases, cold tolerance, and other qualities. At the same time, there are enough similarities among the cultivars to standardize production of the operation.

A beginning grower may find an advantage in growing a few kinds of plants at first, expanding upon this and becoming more diversified as knowledge, experience, and financial strength are gained.

Another form of specialization is in production methods. The grower who specializes in growing liners, ground covers, in propagating for other growers, in container or field production, or in growing shade or specimen trees is also a specialist. To the extent that one standardizes practices and narrows offerings, one may experience the same advantages as the grower who specializes in a certain kind of plant.

Wholesale vs. Grower-retail

In years past, growers tended to sell their plants directly to the consumer. Today an increasing number of growers sell exclusively to wholesale outlets -- distributors, brokers, retailers, and professional landscapers.

There are reasons for this trend. The nursery grower has little time to serve the individual customer because retail sales come during the busy growing season. The retail customer typically requires planting and design information that requires considerable time for a small sale; giving attention to the customer may prevent completion of necessary cultural practices. An alternative is to employ and manage a costly sales labor force. Also, if large plants are sold, then delivery and planting may become problems.

Wholesale marketing involves selling larger quantities of stock to fewer buyers. Wholesale prices received per plant are lower than retail prices, but selling costs are less and, consequently, profit margins may be just as high. Less time is spent in selling, allowing more attention for growing of stock; production management can become more specialized. A deciding factor can be the limitations of human and financial resources. There are usually fewer customer complaints and no guarantees are offered at the wholesale level.

Retailing provides the beginning grower with the opportunity to market small quantities at a time when wholesale marketing may not be feasible. The beginner may have a small number of plants, be unknown in the trade, not yet know marketing channels, and may have lower-quality plants. Homeowner clientele willing to accept lower-quality plants at lower prices may be limited. It is generally easier to sell a high-quality plant at a higher price than a low-quality plant at a lower price.

Advertising and promotion methods differ for retailing and wholesaling. Where a grower is selling both retail and wholesale, two different advertising programs are necessary. See the "Marketing What You Grow" section for more information.

Retailing offers additional rewards for some people. They enjoy personal contact with their clientele and receive satisfaction from serving the public. It may not be easy to cut off a satisfied retail trade if you decide later to only sell wholesale.

Marketing What You Grow

Marketing is more than just selling. Marketing includes advertising, pricing, packaging, transportation, and extension of services to buyers. Services extended include credit, special terms of sale, information, convenient delivery schedules, cooperative promotion, and other favors designed to attract buyers and satisfy their needs.

The new grower is, naturally, concerned with selling plants so that the business becomes profitable. However, before sales can be made, the grower must perform many marketing functions.

Advertising may be the most important. You must inform potential customers that you are in business, and tell them what you have to sell. There are several ways to advertise.

Personal contact is probably the best form of advertising for the wholesale grower. Visit potential buyers to tell them what you're growing, how much you're growing, and when it will be ready for sale. Tell other growers of your operation. Ask them for advice and suggestions, and let them know what you have to offer. Join and participate in grower organizations, activities, and events. The grapevine does work among nursery growers and in the landscape industry.

A clean, neat, well-run nursery operation advertises the nursery when people visit. They will stop by, too, if you arouse their curiosity in contacts with them. Consider sponsoring an open house or tour for other nurserymen and potential customers. A well planned and managed nursery will convince them you're in business to stay. At this point they can accept you as a "nurseryman".

Letters or direct mail ads, aimed specifically at potential buyers, will inform them you are in business and about your products. The telephone yellow-page directories for the cities and towns within the area you plan to serve provide excellent customer contact.

This preliminary contact will bring future sales. It needs to be done early. Plan to be well-known when the stock is ready for sale. A mistake many new growers make is to wait until the plants are ready to sell before trying to sell. Selling yourself is as important as selling your product.

If one plans to grow and sell retail, there are additional considerations. One must inform the public of the existance of your business. Newspaper, radio, and television ads; signs; direct mailings; having an open house; hosting or sponsoring gardening programs; and inviting local schools to visit are all possible methods of advertising. Experimentation is required to determine the most effective methods for your operation.

Attending and exhibiting at nursery trade shows, local home and garden shows, plant societies and garden club shows or meetings, and similar events sells you and your wares and skills to the trade and the public.

When extending services to customers, discretion and good judgment is necessary. A beginning grower is seldom in a position to extend credit, special terms, and other services that require bearing financial burdens.

Having quality plants at competitive prices is, perhaps, your best marketing tool. Few people and markets will be willing to buy until they are satisfied that you can grow quality stock. Consequently, you must have quality stock to enter the market and attract buyers. The initial cost may be high, but once you gain management experience, good plants may cost less to produce than poor plants.

Here are additional tips for marketing nursery stock:

- Label all plants with correct and complete information. A plant name tag should be used, preferably with a picture of the plant. A color picture tag is an excellent marketing tool for some markets, especially retail outlets. Retailers often like a tag that indicates mature plant size, bloom color, planting instructions, and plant care.

- Market an attractive plant package. A good container, such as many of the available plastic ones, complements a good quality plant. Know the preferences of your market because some types of containers are not acceptable.

- Deliver on the promised delivery date. Failure to fulfill this commitment will harm your reputation. Don't oversell or sell yourself short.

Available Markets

You must find and develop your own market system. There are no central markets, centralized auctions, or typical agricultural markets for nursery stock.

Some of the markets more readily available to Virginia nursery growers include:

- Retail nursery and garden stores. These are independently owned businesses selling to homeowners and gardeners. They will purchase stock from many different sources because no one nursery will be producing all the different kinds of plants they sell.

- Volume outlets. These are the mass merchandisers -- large department stores, lumber or building suppliers, supermarkets, and others -- that sell a variety of merchandise on a volume basis. Many are chain organizations. Their customers are homeowners and gardeners. Nursery stock may be bought by a regional buyer, the local store manager, or both. Inquire locally for the name and address of the store's buyer. This market often requires large quantities of stock, and deliveries may be necessary at more than one location.

- Larger nursery growers. Larger growers will sometimes buy stock from other growers to fill an order. Learning about possible opportunities is where the "grapevine", discussed earlier, can work for you.

- Other nursery growers. Several Virginia nurseries are interested in buying stock for growing-on. Some will buy rooted cuttings and liners from propagators. Others buy fairly large plants to grow into larger specimens.

- Landscape contractors. Landscape construction jobs, such as highways, industrial and commercial developments, public building, parks, golf courses, schools, and apartments require large quantities of nursery stock. Landscape construction firms may be found in the telephone directory yellow pages.

- Landscape maintenance. Many landscape maintenance people buy nursery stock for replacements and small construction projects. Check the telephone directory yellow pages.

- Public gardens, golf courses, parks, arboreta, schools, and colleges. This is a limited market because many contract with professional landscapers.

- Homeowners and home gardeners. This is THE market for the growers who sell retail. These sales require an entirely different approach to marketing, including display, promotion, and selling, than those previously discussed. See the earlier discussion on "Problems of Being a Grower-retailer."

- Mail order. A possibility; but this specialized marketing requires sophisticated promotional efforts, specialized shipping techniques, and may adapt better to some plant materials than others.

Contract Growing

In the McMinnville, Tennessee area there is a large number of contract growers that supply established nurseries. The established nursery may provide the seeds, seedlings, or liners to the contract grower, and then the plants are sold back at maturity at a predetermined price. This is not an established practice in Virginia, but may be a possibility.

BEWARE of out-of-state parties looking for nursery growing contracts. The grower agrees to buy liners, rooted cuttings, or other material at premium prices from the contracting company. The company guarantees to buy the plants upon maturity and promises to help the grower with production information. The plant material supplied is usually of low quality, and the company is usually non-existent when the stock is ready for sale.

Nearly all of these contracts have been made with inexperienced growers. Quality of the stock upon maturity is often poor and the plants are unsalable. Plants offered to growers are frequently in great supply or have little market demand; very often, they are inexpensive forest species.

The inexperienced nursery grower is particularly vulnerable to the persuasive tactics of these sales people. Study and review the contract with an experienced nursery grower, your attorney, your financier, and your accountant before signing the contract.

However, there are good, legitimate contract arrangements available. This discussion is not intended to detract from them, but to make one aware of problems. A good contract offers financial advantages to the grower.

Pricing Your Stock

Price your stock on sound information to assure yourself a profit. Pricing is an individual decision without an organized marketing structure.

The basis for pricing should be the cost of producing the specific plant to be sold. Production costs include not only supplies (e.g., fertilizers, pesticides, and containers), labor, equipment, soil preparation, growing media, irrigation, and other cash costs, but also depreciation on equipment, general overhead expenses, taxes, dues, licenses, fees, insurance, payroll expenses (social security, workers compensation), interest on land and capital, and plants not sold. Some growers suggest pricing stock high enough to include services provided (such as tagging and shipping). Once costs are determined, the grower can add the desired profit to arrive at an appropriate selling price.

Some growers price plants so that, overall, the nursery makes a profit, but do not know the production costs for each plant grown. An effort should be made to determine cost/return information on each type of plant. It is difficult to justify growing unprofitable plants.

Believing it will help them establish a clientele rapidly, many new growers attempt to attract customers by pricing their plants lower than those being sold by established growers. But, doing so may gain them undesirable reputations in the nursery industry. If they are selling quality stock at cut-rate prices, they are losing money. If their plants are not worth the existing market price, it will pay them to improve the quality and price their stock competitively. Also, at any time and for whatever reason, dumping low-quality or distressed stock at below-market prices hurts the entire industry and is especially damaging to a grower's reputation.

Even after determining production and marketing costs, and setting a desired profit margin, the selling price usually cannot deviate very much from established prices. If you cannot grow plants profitably at existing prices, you need to find other investments. Hard-to-find plants and those in great demand are exceptions and provide more pricing flexibility.

Useful guides in pricing nursery stock are the catalogs from other nursery growers, buyers, mail order firms, and retailers.

Nomenclature

Mutual knowledge of plant names is a link between seller and buyer. Accurate labeling is necessary if buyers are to feel secure with their purchases. The grower must make every effort to identify and label plants correctly.

Botanical (scientific) and common names of plants are both used in the nursery trade. But, common names are a constant source of confusion and embarrassment because certain plants may have four or five common names. The Latinized botanical name is the only reliable and accurate plant name. Most nursery catalogs list plants alphabetically by scientific name. It's well to learn plants by these names. They may appear complicated at first, but

they are learned with practice and usage. Pronunciation can be perplexing, but several books provide pronunciation guides (see Appendix D, Suggested Reading).

Plant nomenclature uses the binomial or trinomial system; that is, the technical name includes the genus, species, and cultivar. For example, the botanical name of the Japanese holly is Ilex crenata. Ilex is the genus, and crenata is the species. The genus name is always capitalized and listed first; it is followed by the name of the species, which is not capitalized. The cultivar, meaning (culti)vated (var)iety, is written third. Thus, Ilex crenata 'Convexa' is commonly known as Convexleaf Japanese Holly. Botanical names are italicized or underlined to denote the Latin. Names of cultivars are enclosed in single quotation marks, or are accompanied by the abbreviation cv., but not both.

There is considerable confusion and misuse of names, especially botanical names, in the trade. You should carefully study and use the correct nomenclature.

LEGAL STRUCTURE OF THE BUSINESS

The best legal structure for a nursery business can be determined only on an individual basis. The three types of legal structures are:

1. Sole proprietorship is the simplest form of business structure. It requires no legal formalities to begin or to end. Profits or losses are treated as personal income, and the owner is personally liable for debts, taxes, and litigation resulting from business activities. Even with this simple business structure, careful record keeping of expenses and income is essential.

2. Partnership is the simplest way for two or more people to enter a business together. This allows pooling of labor, talent, and financial resources. Partners are taxed separately in proportion to their percentage of ownership. Partners are personally accountable for all liabilities of the partnership. No formal documents are required, but drafting of a partnership agreement is advisable.

   There are many inherent problems that limit the life of a partnership. For example, assume a 2-way partnership where each partner provides 1/2 of the investment capitol and 1/2 of the labor. It is difficult for both partners to maintain the same momentum. Eventually, the inputs of labor or capitol become unequal and strain on the relationship occurs.

   The partnership agreement can anticipate these problems and make provisions for unequal labor and capitol inputs. It should also include a buy/sell agreement that outlines terms for dissolution of the partnership.

3. Corporations have the most formal business operating structures. Corporate Charters are issued through the State Corporation Commission. Fees are charged by the state at the time of initiation and on an annual basis, and annual reports must be filed with the State Corporation Commission. The chores of incorporation should be done by a lawyer. Legal fees associated with simple incorporation will probably total about $500; but, they could vary significantly, depending on the individual lawyer's fees and complexity of the business.

   Corporations are legal entities separate from their owners. To become an owner and share the profits (and losses) of a corporation, individuals buy shares (stock) of the corporation, but these individuals are insulated from the liabilities of the corporation. Corporations provide great flexibility to bring in new individuals and new capitol through the sale of shares in the business. Death of an individual share-owner does not end the corporation as it does a partnership. An easy means is provided to end a corporate partnership; one partner needs only buy the other's shares of stock.

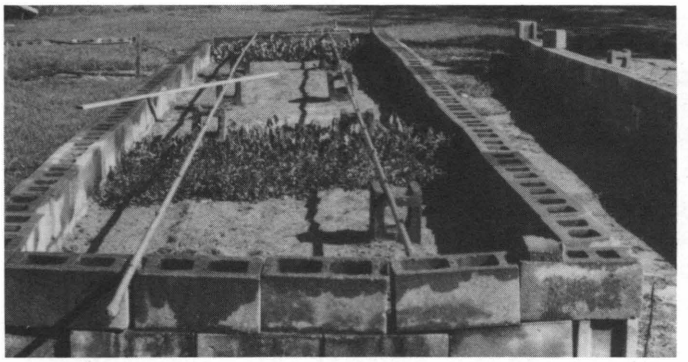
   A potential disadvantage of a corporation is the concept of double taxation. Corporate profits are taxed first at the corporate level and again at the individual level when profit distribution is made from the corporation to the individual. Corporate tax rates are generally much lower than individual rates. The guidance of an accountant and/or lawyer may be in order before making a decision to incorporate.

4. "Subchapter S" Corporation allows for the liability separation of the individual from the business but returns profit or loss to the individual or partners of the "Subchapter S" corporation. This arrangement is advantageous often to individuals in low individual income tax brackets or to individuals in higher tax brackets if the business is showing an operating loss. Later, when the business begins to show a significant profit, a change to the regular corporate structure may be in order.

PRODUCTION METHODS

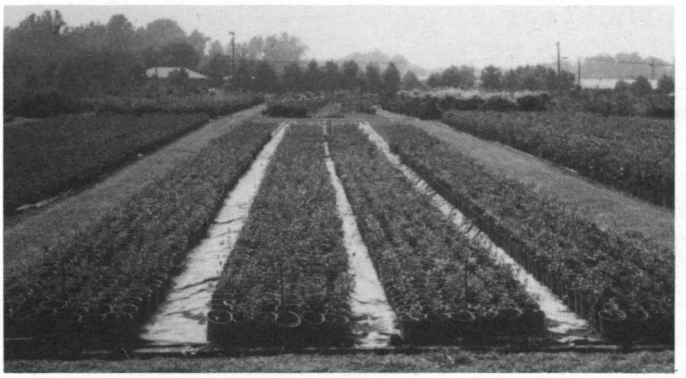
Virginia's nursery industry is diverse, producing a wide variety of plants under different climatic and cultural conditions. Nursery stock is grown in the field, in beds, in containers, and in pots, bags, or flats. As late as 1950, nearly all stock was grown to maturity in the field. Since that time, growing plants in containers has steadily increased and has replaced much field production.

Field- or bed-grown stock is sold balled and burlapped (B & B) or bare-root. An increasing amount of field stock is dug with root-soil balls intact and placed in containers for marketing. Peat

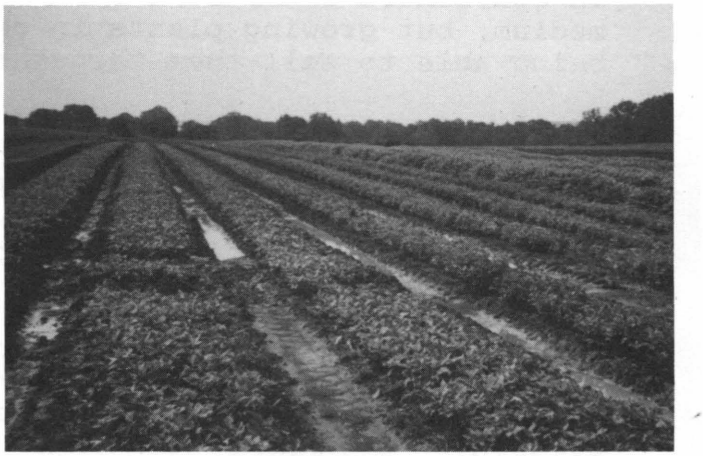


Simple portable outdoor plant propagation bed with mist nozzles for plant propagation. Rooted cuttings can be left in the bed over winter by covering with cold frame sash or milky (opaque) plastic. (Department of Plant Science, University of Rhode Island, Kingston, RI)

Field production of young flowering trees. Weed control and tillage are necessary to produce quality plants. (Waynesboro Nurseries, Waynesboro, VA)



Plants grown in containers are placed close together for early growth to conserve space, and placed on black plastic for weed control. (Lancaster Farms, Suffolk, VA)



Bed production of plants, such as azaleas and Rhododendrons. Rooted cuttings are placed in beds on a 12" by 12" spacing.

Liner production in fiberglass greenhouse. Often covered with saran cloth in place of plastic.

Outdoor seed bed production of evergreen seedlings. (Musser Forests, Indiana, PA)

balling of bare-root stock is practiced by a few large nursery growers who supply retail and volume outlets.

Fruit and nut trees, deciduous shrubs, roses, shrubs, and seedling trees are often dug and shipped bare-root. Rhododendrons, conifers (narrowleaf evergreen trees and shrubs), some broadleaved evergreens, and larger deciduous ornamental trees are usually dug and shipped B & B.

A variety of plants are grown in containers in Virginia. Common container-grown stock includes shrubs (broadleaved evergreen, deciduous, and coniferous), groundcovers, vines, smaller deciduous and coniferous trees, and some herbaceous perennials. Most field grown plants can also be grown in containers. Trees grown to larger sizes and specimen-size landscape plants are generally grown in the field. Some growers are now offering large trees in large containers called "tubs". Volume production of large plants in containers is limited by the cost of containers and the growing medium, but growing plants in containers offers the advantage of being able to sell them throughout the year.

Seedlings, rooted cuttings, and liners are often produced by specialized nurseries that sell them to other nursery growers bare-rooted, in pots, or in flats. An advantage of growing this type of material is the rapid turnover of inventory and money. However, this is a specialized cropping system requiring more expertise and precision than field production. The market is also specialized and may be limited because many nurseries propagate their own plants or buy from out-of-state. Consequently, extra effort will be required to develop this market. Virginia presently lacks any nursery firm specializing in seedling/liner production. It would seem that there is a good opportunity for someone in Virginia to pursue this type of production.

A variety of ground covers, herbaceous perennials, succulents (sedums, sempervirens, and others), small shrubs, and specialty items are grown in pots for the garden trade. Some herbaceous perennials are also field-grown and either sold in clumps or dug and potted.

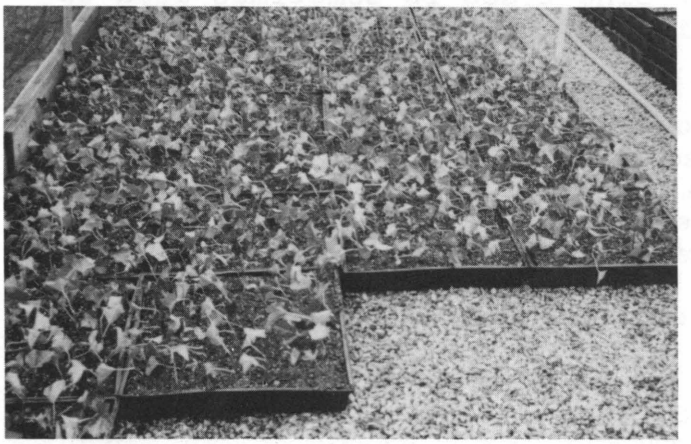
Container and field growing are the two main nursery production methods. The grower must decide which of these production methods, or what combination of them, will be used. Available resources will play a major roll in this decision (i.e., if land is limited, container production is favored).

Growing in Containers

Production of plants in containers has become popular for a number of reasons. Container-grown stock can be harvested and marketed year round, whereas field-grown plants offer less market flexibility.

Rhododendron grown in containers spaced out for summer growing. During winter they are packed can-to-can inside the winter protection house. (Buckingham Nurseries, Dillwyn, VA)

Container-grown plants in beds between pines for winter protection. The partial shade reduces summer heat and provides better plant growth. (Greenbrier Farms, Chesapeake, VA)



English Ivy cuttings direct-rooted in flats and can also be marketed in the same flat. (Ingleside Plantation Nurseries, Oak Grove, VA)

Field production of large shade trees. Straight trunks and full heads are obtained by careful pruning. (Angelica Nurseries, Kennedyville, MD)

Container-grown maple trees. This production method eliminates digging and allows for easy shipment during the growing season. (Carolina Floral, Monks Corner, SC, now Carolina Nurseries)

Field production of spreading junipers. Uniform growth simplifies harvest as plants can be dug row-run. (Angelica Nurseries, Kennedyville, MD)

Container growing offers certain production efficiencies, but is far more capital-intensive than field growing because of the specialized structures and equipment requires. However, several times as many plants can be grown per acre as compared with field- or bed-grown stock. And, the need for less land, less irrigation equipment, less transporation equipment, and other economies can result from this space saving. Furthermore, new ideas and equipment are continually arising to reduce the costs of and simply planting, potting or canning, handling, fertilizing, pruning, and irrigating container-grown stock. Also, the artificial medium commonly used in container-grown plant production give the grower more control over plant growth and over fertility and irrigation; and properly composed medium assures better drainage and fewer root disease problems.

The roots of plants being grown in containers are more exposed to cold and heat than those being grown in the field. Winter protection is needed, and timely irrigation is required during hot weather. Shade from a stand of pine trees is sometimes used to moderate climate. This may suffice for winter protection and reduce irrigation.

The area used for container-grown plant production requires a higher investment. Grading is necessary to provide proper surface drainage. Gravel or plastic is required under the containers. Irrigation is a must, and permanent irrigation systems are often installed. Roads and access lanes are required.

A high portion of the investment with container stock production occurs initially with placing plants in containers. With field production, the large investment comes at harvest when plants are dug. Risk of losing investment capital is greater with container production because greater investment comes early in the production cycle.

B & B stock is preferred over containerized plants by some landscapers. Container plants are often more difficult to establish in the landscape, especially when the growing medium and the landscape soil differ greatly in texture and structure. The containerized plant does, however, include all of the plant roots while the balling operation severs a high percentage of the root system of a field grown plant.

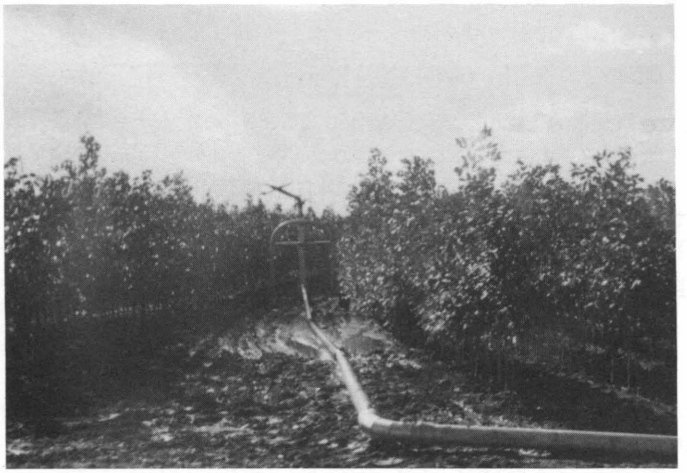
Container growing media are usually not fumigated when they contain pine bark, sawdust, vermiculite, and perlite or peat moss as it is pest free. When soil or material that could carry weed seeds, insects, diseases, or nematodes is included, sterilization is necessary.

Growing in Fields

Growing plants in fields requires less precision and there is more room for grower error. Soil is seldom totally deficient in any essential nutrients, as is possible with artificial media.

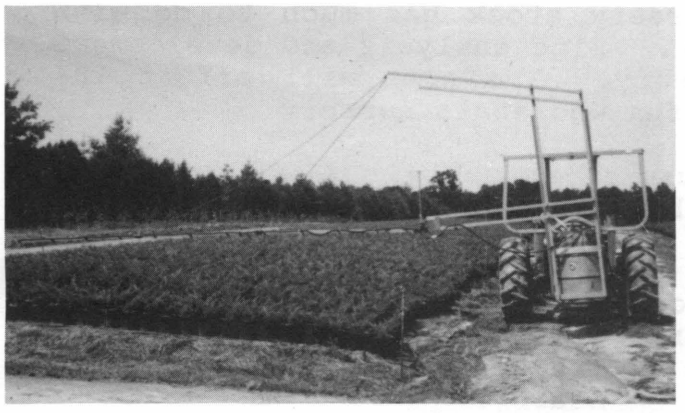
Field production of Japanese Holly. (Carolina Floral, Monks Corner, SC, now Carolina Nurseries)

Field production of Japanese holly utilizing close or bed spacing over row spacing to get more plants per land area. (Carolina Floral, Monks Corner, SC, now Carolina Nurseries)



Irrigation insures optimum growth of nursery stock. (Bailey Nurseries, St. Paul, MN)

Weed control by hand is a costly operation and has been mostly replaced by herbicides. (Peninsula Nurseries, Melfa, VA, now United Nurseries)



Plants grown in containers being sprayed for insects with offset spray boom. (Historyland Nursery, Montross, VA)

Field production of Fraser fir established in sod after killing planting strips with herbicides. (VPI & SU Extension Demonstration, Mt. Rogers, VA)

Field-grown plants require less irrigation during the summer than container-grown plants. Normal rainfall will supply water needs for field-grown stock during most growing seasons.

Control of weeds with herbicides in the field is safer than in containers. Field stock can be mechanically cultivated rather than hand weeded. Cultivation and herbicides are less costly than the hand work that is often required to remove weeds from containers.

Shade and ornamental trees, deciduous fruit trees and shrubs, small fruits, and narrowleaved evergreen trees must grow for several years to reach salable size; consequently they are more likely to be grown in the field than in containers.

Soil fumigation will control weeds, insects, diseases, and nematodes. Fumigation is costly, but the expense is justified when sowing beds or planting a high-intensity cash crop like azaleas.

Field vs. Bed Growing

Spacing for field growing will give population densities of 2-4000 plants per acre. High-density beds can accommodate 10-12,000 plants per acre. A grower may find it more efficient to grow plants in beds. Fertilizer, pesticide, and irrigation costs less per plant under high-density planting. Azaleas, rhododendron, Japanese holly, and other small plants are often produced in this manner.

Facilities Required

Location, land and soil quality, water source and supply, and building and equipment needs must be carefully considered before committing oneself to grow nursery stock.

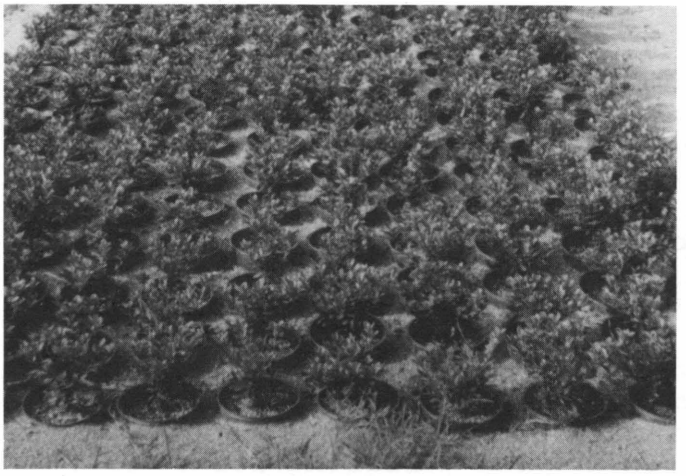
Importance of Location

How and where you market your nursery stock has much to do with the best location for a nursery. Site analysis and development is important in planning a nursery. The site will affect the production and marketing costs of a wholesale nursery.

For retail sales, public exposure is valuable. A well traveled street or road will bring in much business without expensive advertising.

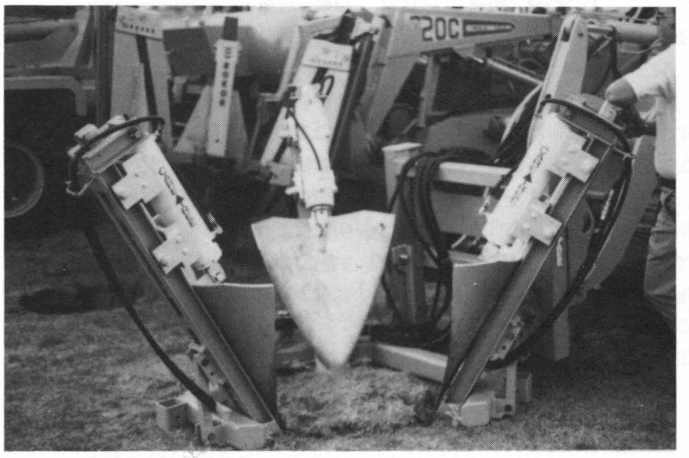
The wholesale grower has other considerations. How far away are the shipping points? Transporting plants from the nursery to the customer is costly. Is the type of transporation you plan to use -- truck, postal, or air service -- nearby?

Are there other growers in the vicinity? Being near other growers, even competitive growers, has distinct advantages. Buy-

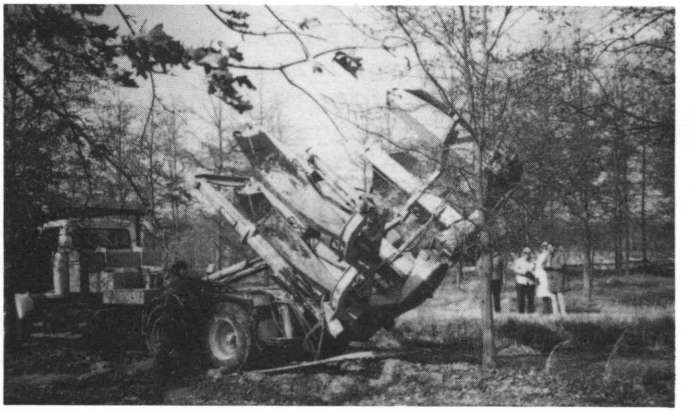


plants grown in containers plunged in ground and mulched with sawdust. This reduces need for irrigation. A problem is that the root system may develop outside the container. (Kemper Nursery, Farnham, VA)

Mechanical tree digger removing a large shade tree. The planting hole at the landscape site has been pre-dug. This allows tree to be handled without burlapping and tying. (Greenbrier Farms, Chesapeake, VA)



A compact mechanical tree digger with telescoping hydraulic cylinders.



An 84" Vermeer mechanical tree digger preparing to dig a large shade tree. (Greenbrier Farms, Chesapeake, VA)

Field production of Arbor-vitae. Row spacing is designed to accommodate tillage equipment. (Forest Nursery, McMinnville, TN)

Hand digging a shade tree requires lots of labor. Following digging, the ball is wrapped with burlap and tied with twine.

ers are more likely to visit an area where a group of growers can provide a larger selection or supply of stock. Smaller growers especially benefit when other growers are nearby. Also, several nurseries in an area will find more nursery supply salesmen and chemical suppliers visiting the area. If they will work cooperatively, they can pool orders for supplies and receive quantity discounts or reduced delivery costs.

Soil is an important factor. Will the soil support a nursery operation? Does it have good internal and good surface drainage? A nursery site for field-grown stock should have well-drained soil such as clay-loam, silt-loam, or sandy-loam. Rocky soils interfere with cultivating and digging operations. Digging costs for field-grown nursery stock range to several thousand dollars per acre. Rocky or adverse soil conditions can greatly increase harvest costs and plant quality. Your local Extension or Soil Conservation Service personnel can provide soils information.

Slightly sloping land, less than 5 degrees, is ideal because it provides good air flow and surface water drainage, which are important for disease prevention. Hill tops may not be well suited to nursery growing because they may be windy, dry, and may lack soil depth for digging. Summer winds may adversely influence sprinkler irrigation efficiency. High winds can cause plant injury and destruction and require special plant training or staking. The site should not flood and should be free of frost pockets. In selecting a location, be aware of the variations in temperature and precipitation patterns throughout Virginia. Some areas are more protected and have more favorable climates than others. Elevation greatly influences climate, including precipitation and temperature. Also consider the climatic requirements and tolerances of the plants to be grown.

Nursery operations are labor-intensive. Is there adequate labor in the vicinity? Reliability and responsibility are essential employee traits when dealing with a high-value crop that takes years to mature.

Taxes and zoning can be important considerations. Taxes tend to be lower away from cities. Urbanization could result in tax increases so great they would drive a nursery out of business; this is less likely to occur when it is located beyond the area that is apt to be urbanized. However, the traffic generated by well-populated communities will usually more than offset the tax burden of the grower who sells retail.

Zoning of the property should be checked with the appropriate county or city planning department. Not all zone classifications permit agricultural operations. Can retail nursery sales be made in agricultural zonal areas? Nursery and greenhouse operations are usually permitted in farm zones but may not be allowed in other zones. Proper zoning provides protection from encroaching and conflicting land uses that might threaten the future of the nurs-

ery operation. Residential zoning frequently imposes restrictions on accepted and necessary farming and nursery practices.

Public utilities are a must. Electricity and telephone are important to every nursery operation. Natural gas for heating may be the least expensive fuel for heating, but it may not be available. Be sure to check available fuel sources and supplies to determine that they are adequate for current needs and for future expansion. Heating and cooling costs can be quite sizable for a nursery specializing in propagation, but probably would not be significant for a field operation.

Once you select the site, the land itself deserves throughtful consideration. The acreage should be sufficient for future expansion and permit efficient layout and operation. Shape of the parcel can be important too. A long road frontage might favor a retail operation but create security problems for a wholesaler. Good buildings, a good well, and a good home would be bonuses in a land parcel for a nursery operation. Visits to existing nurseries will aid you considerably in planning a nursery layout.

Water Supply

Good water in adequate amounts is essential.

It may be necessary to irrigate container-grown plants daily when air temperatures reach 95°F (35°C) to 100°F (38°C) or higher. Water requirements during the summer may be up to 3 inches per week per area covered. Depending upon plant size and kind, it is possible that 1 inch of water per day may be needed in hot, dry, windy weather.

One acre/inch of water equals 27,154 gallons per acre. This equates to an irrigation system that provides about 140 gallons per minute to irrigate one acre at a time. Using 22 sprinkler heads that deliver 6 gallons per minute each, on 40- by 50-foot spacings, about three and one-third hours would be required to apply 1 acre-inch of water. To convert measurements to metric units, see Appendix A.

Plan a system capable of irrigating up to a third or half of the nursery stock at one time on a hot day.

Irrigation suppliers can determine suitable irrigation equipment, proper design of the system, and needed water capacity. The water supply and irrigation system should not only meet present needs, but should also provide for possible future expansion.

Field-grown stock requires less exacting attention to irrigation than container-grown stock, but irrigation timing and frequency can still be critical with certain kinds of plants, such as some of the broadleaved evergreens. Irrigation of field-grown stock in the late summer or fall allows earlier fall digging.

A water test will determine suitability of a water supply for nursery production. Water samples may be sent to the Division of Consolidated Laboratory Services through the local Health Department or Extension agent. This laboratory tests, primarily, domestic water samples and does not have a standard irrigation analysis. A special request must be made to inform them that the analysis is to test for irrigation suitability. Private water testing laboratories perform such tests on a more routine basis, but they also must know for what the water will be used so that they can perform the appropriate test.

The pH (acidity or alkalinity) of the water should generally be 6.5 to 7.5, but fertilization programs can be adjusted to compensate for a water pH slightly above or below this range.

Water which is high in soluble salts can be troublesome to growing plants. Electrical conductivity, a measure of soluble salts, should be less than 0.75 milliohms/cm (450 parts per million, or ppm). Water with higher readings would require careful irrigation management, especially for salt-sensitive nursery crops (i.e., more frequent irrigation with excess water application each time to insure leaching, and not letting the soil become dry).

Water that has a high iron content can cause an unattractive rust-colored accumulation of iron salts on plants. These iron compounds are not directly harmful to plants. But, they can result in the unsightly appearance of plants, and, in severe cases, reduce light levels to a point where growth is reduced. Some water tests, especially those that test water for household use, give information about iron content. Rust deposits in sinks, bath tubs, toilets, and from drippy faucets are a clue that the water may have a high iron content.

Well water is preferable to runoff water taken from ponds, lakes, or streams. Runoff water may contain weed seeds, nematodes, algae, disease organisms, fertilizers, herbicides, and various other potentially harmful materials. Thoroughly investigate surface-water sources before using. Some nurseries inject chlorine, a disinfectant, into the water supply while irrigating to control disease and algae.

Water from springs compares favorably with well water. However, it is often in limited supply, and seasonal fluctuations may cause water shortages. Maximum water need comes in the dry summer when spring flow is at its lowest. Storage facilities, such as ponds, will help overcome seasonal shortages, if there is adequate storage capacity. Storage ponds and lakes do expose water to contamination, as with runoff water discussed above.

If you plan to use water from a stream, spring, or lake, be sure there is no chance for someone to divert the water and leave you with an inadequate water supply. Check your water rights and irrigation priority with the Virginia Department of Water Resources, Richmond, Virginia.

Municipal or community water systems are usually good irrigation water sources, but obtain a water test to be certain. Also, municipal water is expensive in the quantities needed for nursery production. Chlorinated water is satisfactory for irrigation, and is not harmful to plants. Softened water is not recommended for irrigation because the sodium used in the softening process can result in plant toxicity.

Some growers have a back-up water system in case the primary water source fails. This is important in container-growing operations and with field-grown plants that require cooling on hot summer days.

NURSERY STRUCTURES AND EQUIPMENT

Seriously consider the need for nursery structures before constructing any buildings. Greenhouses require considerable money to build and to operate (heat, ventilation, electricity, and water). Since the major need for greenhouses is propagation, purchase of rooted cuttings or liners may be more economical. Summer or outdoor propagation that utilizes inexpensive structures is possible, but occurs at a time when other aspects of production may be pressing.

There are advantages to waiting a few years before building structures. One learns by experience, and needs and plans change as the business grows. Greenhouses, lath or shade houses, storage and utility buildings built in the first few years may be inadequate, unadaptable, or in the wrong location as the nursery operation becomes better established.

Plan and locate structures so that future additions can be easily constructed. Do not spend large amounts of capital on buildings and land and not have sufficient funds to operate the field growing operation. Remember it's a long time until the first harvest.

Construction plans for greenhouses, barns, etc. are available from your county Extension office, building materials dealers, nursery and greenhouse suppliers, and manufacturers.

The type of structure, such as type of greenhouse (glass vs plastic) may affect taxation of your structure. Contact your county assessor's office for more information. Also greenhouses meet the criteria of single use structures and are subject to rapid depreciation by the IRS.

Greenhouses

Greenhouses at a nursery are used primarily for plant propagation, growing liners, or for winter protection. The use will help determine the kind to build. Propagation houses may be used yearround and tend to be permanent structures; but, overwintering

houses may be used only for short periods and can be temporary structures cheaply constructed.

Common greenhouse coverings are polyethylene plastic, clear fiberglass, and glass. Polyethylene plastic is the least expensive but must be replaced every one to three years, depending on grade and quality. The newer ultra-violet-resistant plastics have a 2-3 year life, but construction-grade plastic may not last one season. Clear fiberglass is several times more costly than polyethylene, but is less expensive than glass. Fiberglass will last from 10 to 20 years with good care and depending on type and quality of the material. Fiberglass must be carefully installed and protected against fire because it is flammable.

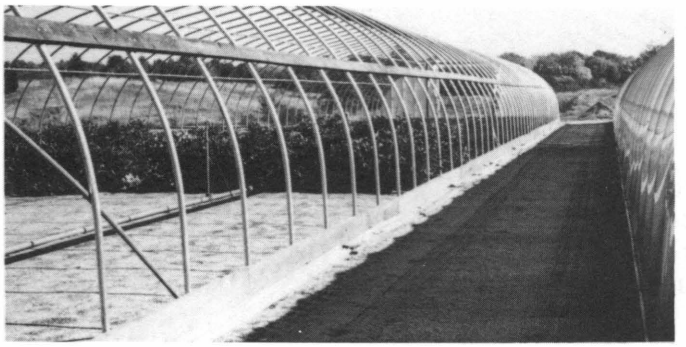
Heating is a major cost, and energy conservation is a must. The most heat-efficient covering is a double layer of polyethylene, with the layers separated by air blown between them from a small fan.

Heat efficiency or energy consumption is related to the amount of exposed greenhouse surface or covering. For example, corrugated fiberglass has considerably more exposed surface than flat fiberglass. Greenhouses with gable-roof construction have less exposed roof surface than equal-sized greenhouses of quonset or arched roof style. If two or more greenhouses are needed, heat will be conserved if the houses are constructed so that they are joined. Several commercial firms market gutter-connected houses; referred to as "ridge and furrow" greenhouses. These houses are efficient and easy to expand.

Greenhouse framework may be of wood, steel, or aluminum. Steel pipe is the most common, but steel or aluminum tubing, rod, and angle shapes are also used. Steel and aluminum require less maintenance and last longer than wood, but often have a higher initial cost. Wood should be a rot-resistant variety or be treated with wood preservative. Painting extends the life of any structure, reflects more light, and helps maintain glazing for longer periods of time. Pentachlorophenol ("penta") or creosote should never be used to treat wood inside the greenhouse; the fumes remain toxic to plants for many years. Use only copper naphthenate or other wood preservatives formulated for use in greenhouses.

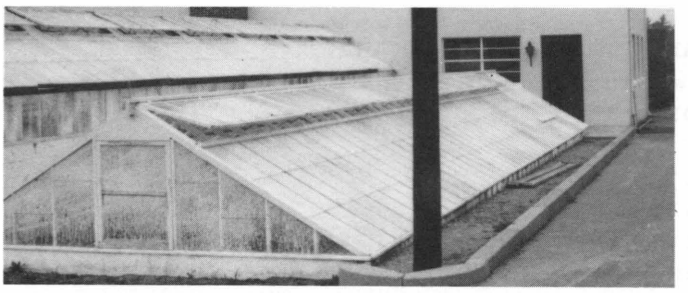
Benches or ground beds are used inside the greenhouse for plant propagation or growing liners. Bottom heat and a mist watering system are required. Ground beds require more heat than raised benches to maintain a desirable temperature for propagation. Heat loss from ground beds can be greatly reduced by installation of styrofoam panels below the heat pipes during bed construction.

Greenhouses are heated by oil, natural gas, propane, coal, and recently wood. Electricity for heating is very expensive, but could be used for convenience in a small system. Suppliers should be contacted and the many heating methods investigated before

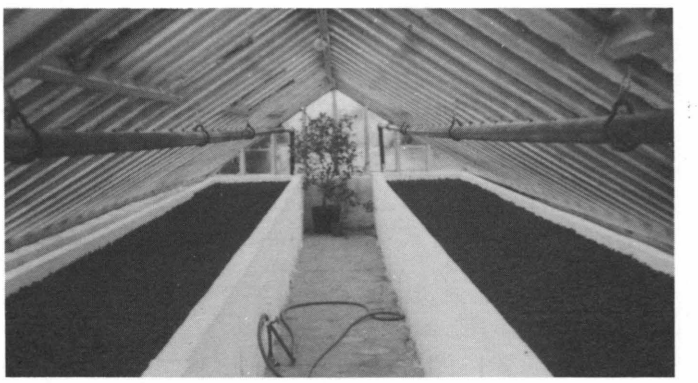


Pipe frame greenhouse for winter protection. Space between houses for spacing plants for summer growing and for moving into and out of greenhouses. This grower-constructed house is 196' long, 30' wide, and 14' high. (Roadview Farm Nursery, Gloucester, VA)

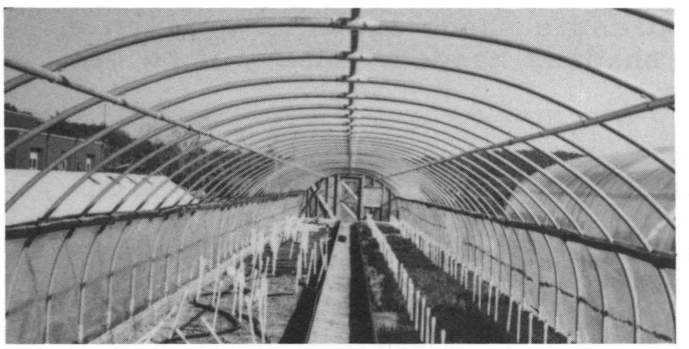
Small hoops covered with milky white plastic for winter protection. This arrangement provides for very economical winter propagation. (Forest Nurseries, McMinnville, TN)



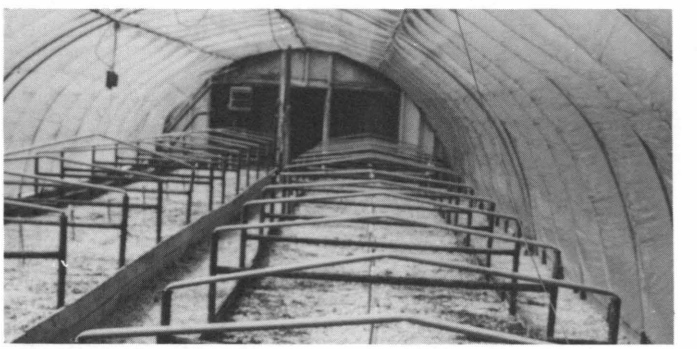
Pit-type or sunken greenhouse for plant propagation. This type construction conserves heat in winter and reduces need for summer cooling. (Forest Hill Nurseries, Exeter, RI)



Inside pit or sunken greenhouse for plant propagation. Bottom heat is provided under the propagation medium. (Bald Hill Nurseries, Exeter, RI)



Pipe frame propagation house. Plastic pipe for water supply and risers to hold misting nozzles. Left side shows system during construction and right side shows completed system with cuttings inserted for summer propagation. Cuttings are left in the beds during winter and the top of the house is covered for winter protection. (Bald Hill Nurseries, Exeter, RI)



Quonset plastic greenhouse with inside benches covered for plant propagation. A house-within-a-house construction. Heat is provided by hot water pipes under the benches. This arrangement requires minimal heating. (Roadview Farm Nursery, Gloucester, VA)

constructing the greenhouse. A backup system is desirable to provide emergency protection.

Ventilation must provide air circulation for temperature and humidity control. Ventilation systems, like heating systems, come in considerable variety. Heating and ventilation systems are often sold and serviced by the same suppliers who sell greenhouse structures.

Orientation of greenhouses lengthwise is usually north-south or east-west. The north-south orientation provides more light inside. It is often suggested that gutter-connected, ridge and furrow, houses have a north-south orientation, and independent houses an east-west orientation. Place benches, beds, aisles, and plant rows to maximize light to plants and space in the greenhouse.

Shade or Lath Structures

Azaleas, rhododendrons, Pieris (andromeda), and shimmia are examples of nursery stock often grown under shade. Shading is also common for seedlings grown outdoors.

Wood or pipe supports are commonly used to support lath shades or plastic shade cloth. As discussed earlier, treat wood with a copper naphthenate wood preservative (never use "penta" or creosote). Place supporting cross members 7 to 8 feet (about 2 to 2.5 m) apart. Provide shade by securing between the supports laths that are 2 to 4 inches (5 to 10 cm) wide, or by stretching plastic shade cloth over the supports. Spacing between laths depends upon the amount of shade needed, but is usually equal to the width of the lath; this spacing provides approximately 50% shade. Place the lath north and south to insure alternate sun and shade. Placing lath east and west will result in strips of plants in full sun all day. A large selection of plastic shade cloth is available according to amount or percent of shading needed. Heavy wire can be used to support the shade cloth.

Properly constructed shade structures can be partially or fully enclosed with polyethylene sheeting to provide winter protection. However, plan before constructing the structure, be sure of adequate support; and, a flat, level roof is unsatisfactory under a wet, heavy load of snow.

Winter Protection Facilities

Sudden and extreme winter cold is a threat to nursery production, especially to container-grown stock and to stock grown near the limit of its winter hardiness zone. Cold weather may not be a problem every winter, but the risk is such that container growers must arrange for winter protection, especially for the broadleaf evergreens.

Interior of pit or sunken greenhouse for plant propagation. Sanitation prevents disease problems during propagation. Note use of materials other than wood for house and benches. This house can be easily "sanitized" between crops. (Bald Hill Nurseries, Exeter, RI)

Outdoor propagation beds with dogwood cuttings that are dug and stored indoors over winter. (Bailey Nurseries, Inc., St. Paul, MN)

Quonset plastic greenhouse for plant propagation rooting cuttings directly in flats, reducing labor required.

Liner production in a lath house. Lath should run north and south to provide alternate shade. (Gresham's Nursery, Richmond, VA, no longer in business)

Quonset plastic greenhouse with covered beds inside providing high humidity with bottom heat under flats of cuttings. (Lancaster Farms, Suffolk, VA)

Production of Rhododendron liners in flats in pipe-frame plastic greenhouse. (Buckingham Nurseries, Dillwyn, VA)

The risk is much greater for container-grown stock because the roots are more exposed than for field-grown stock. Roots and flower buds are more cold sensitive than other parts of the plant.

Many of the hardier plants grown by Virginia growers require no cold protection (i.e., junipers, arborvitae). Various references (see Suggested Reading, Appendix D) provide information on plant hardiness.

A simple unheated enclosure is generally adequate for the amount of protection needed. Most unheated greenhouses and shade structures are adaptable to this need. A number of inexpensive polyethylene-covered greenhouse-type structures, especially constructed for winter protection, are used by Virginia growers. Most of these houses are made of pipe or conduit frames, from 2 to about 6 feet (0.6 to about 2 m) high, quonset shaped, relatively narrow and long. Two 10-ft sections of conduit make a house 7 ft high and 12 ft wide. The frames are covered with a single layer of milky-white plastic or with two layers of polyethylene that are held apart by air that is forced between the layers. For the two-layer covering, milky-white polyethylene is used for the outer layer and the inner layer is clear plastic; both layers are 2 or 4 mil thick. Small portable structures can be set up with onset of winter and taken down as soon as the chance of severe cold or hard spring frosts is past. These temporary structures are often used to cover outdoor propagation beds.

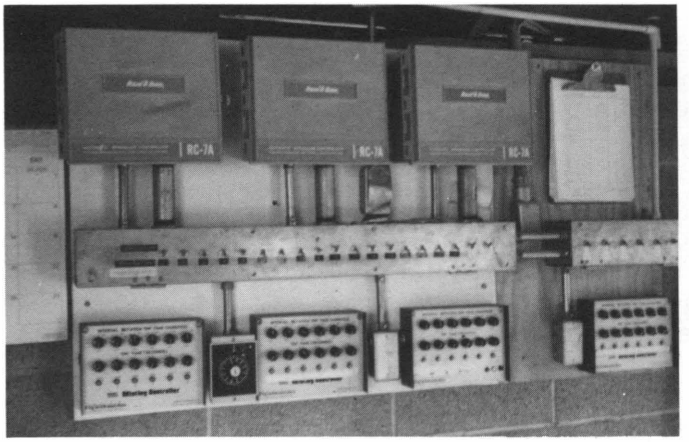
The structures are normally put in place or covered about mid-November. If inside temperature increases during a warm sunny day, the enclosure is ventilated by opening the end doors or by partially uncovering. Watch smaller structures more closely because inside temperatures fluctuate more rapidly.

Another method of cold protection is the use of the Microfoam blanket. Plants are well watered and laid close together on their sides, covered with polyethylene then with Microfoam, and finally covered with a layer of the milky white polyethylene. The plants remain covered from late fall until early spring.

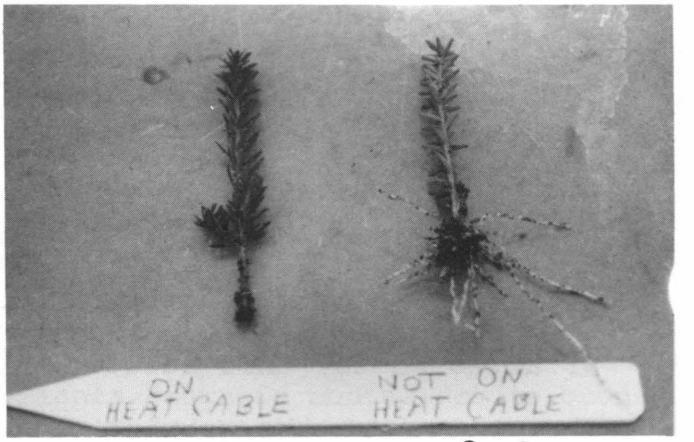
Containers set close together outdoors with sawdust or bark banked around them gives considerable protection. But, this method does not protect against plant dessication (loss of water from foliage). This method has been unsuccessful in the severe cold of recent years. The various methods of providing winter protection may provide an ideal habitat for mice/voles; their appetite for nursery stock can be disastrous to the nurseryman.

Hotbeds and Coldframes

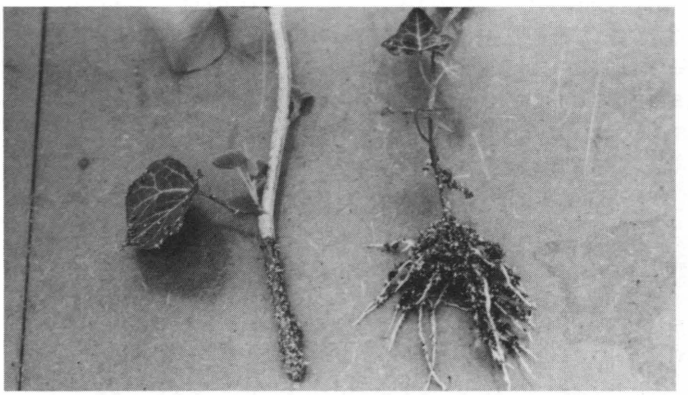
These structures, normally constructed in the same manner except that a hotbed has some form of heat and a coldframe is unheated, can be inexpensive substitutes for greenhouses. The hotbed is used for starting seedlings or for rooting cuttings. The coldframe is useful for winter holding and for hardening rooted



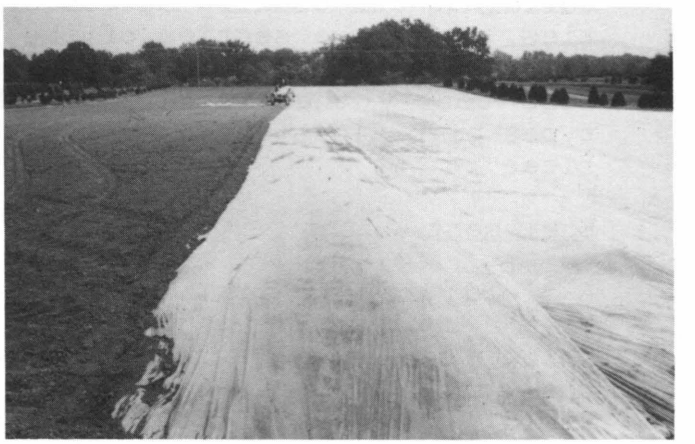
Misting controller for large-scale nursery plant propagation. (Ingleside Plantation Nursery, Oak Grove, VA)



Uniform bottom heat at $73^{o} \pm 3^{o}F$ is desired for plant propagation. In this case the heat cables were too far apart to provide uniform bottom heat.

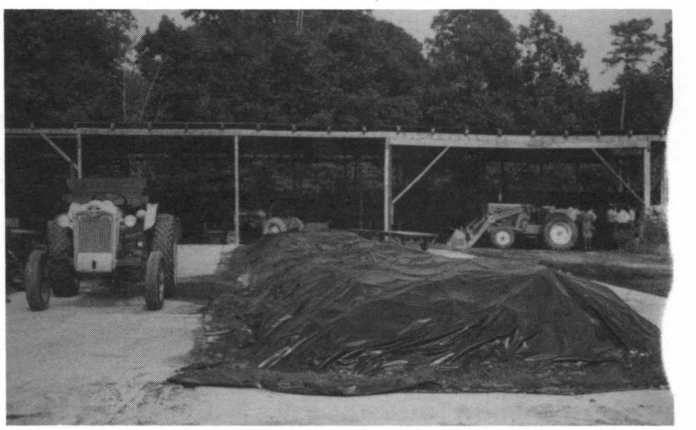


Hedera (Ivy) cuttings are easy to root in juvenile growth (right) but difficult to root when cuttings are taken from mature growth (left).



Field fumigation to control diseases, insects, and weeds before planting azaleas. Large scale application is usually made by commercial firms. (Forest Nursery, McMinnville, TN)

Fumigation is used to control disease, insects, and weeds before using for propagation or growing liners. (Blackwell Nurseries, Semmes, AL)



Fumigation of growing media for growing plants in containers. (Lancaster Farms, Suffolk, VA)

cuttings and seedlings before planting. Temperature is controlled by shading, and ventilation is necessary.

Utility Buildings

One of the nursery's greatest needs is a building for storage of equipment, supplies, and dry shelter for working in winter. A single building for storage, mixing, potting, machine maintenance, and other uses is often used. Also, the nursery office may be in, or attached to, this building.

The nature of the growing operation and financial resources will influence the construction and size of the utility building(s). Field-growing requires more and larger cultivation equipment and fewer facilities for mixing of media than container growing. The specific crops grown also influence building and equipment needs.

A property with existing barns, equipment sheds, and other farm buildings can usually be converted to very useful nursery facilities. Often, a section of the greenhouse is set aside for making cuttings, potting, etc. Pole construction for new structures are less costly than buildings with a foundation. Plans for several types of buildings are available through your local Extension office.

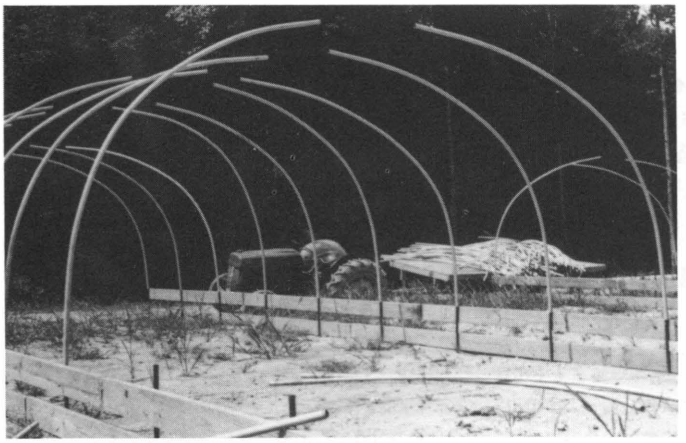
Equipment

A field growing operation requires somewhat different equipment than a container nursery. The field operation requires equipment (plow, sub-soiler, tiller, disc, harrow, and tractor) to prepare the soil, cultivate the field stock, transport liners into the field, haul large stock out, and to root, prune, and dig. The container nursery needs equipment to mix growing media, fill containers, and to transport containers from potting to production areas and then to a shipping area.

Both operations need irrigation equipment, a truck for getting supplies and transporting stock to market, and spray equipment for insect, disease, and weed control. Propagation equipment is the same for both and will be needed if you will be propagating your own plants.

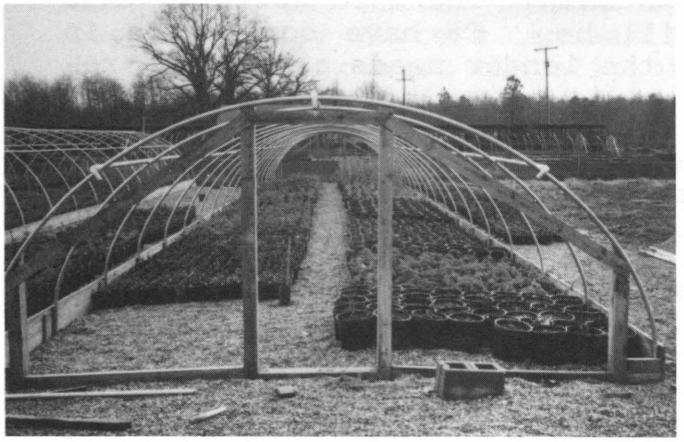
A number of smaller tools are needed, such as shovels, hand pruners, spades, hoes, small sprayers, weighing scales, knives (for budding, grafting, and pruning), garden trowels, and shop tools.

Nursery mechanization is mainly for the mixing of soil and potting for container production, and digging for the field operation. The market for specialized nursery machinery is relatively small compared to much of agriculture, therefore, nursery mechanization is less advanced. Some nursery equipment is available, but many nursery growers adapt other farm equipment to fill the needs of their nurseries. Nurserymen tend to be excellent at improvising.

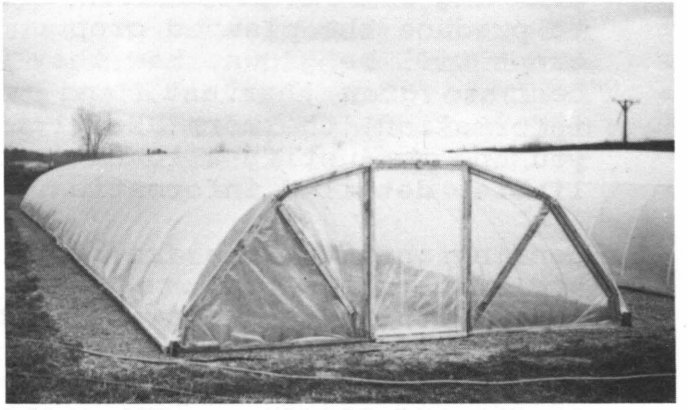


Electrical conduit is commonly used to make an inexpensive house for plant propagation or for overwintering. A jig is used to bend the conduit. Two 10' sections make a house 12-13' wide and about 7' tall.

Plants grown in containers in quonset houses for winter protection. The houses will be covered with milky plastic. (Buckingham Nurseries, Dillwyn, VA)

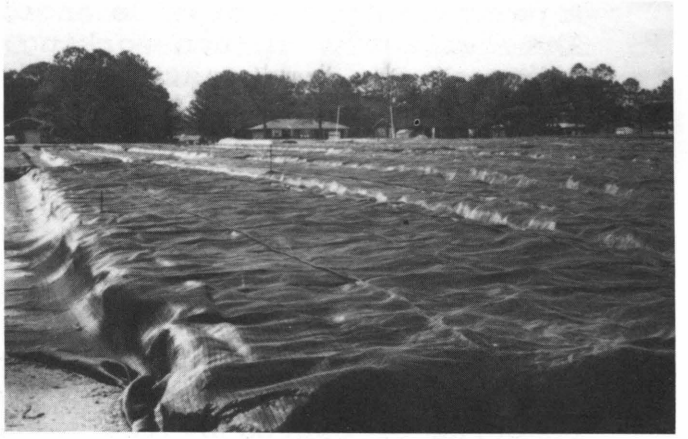


Plastic greenhouse for winter protection. Note simple construction with pipe or 10' sections of electrical conduit can be used. (Glenwood Nursery and Garden Center, Richmond, VA)



Plastic covered house for winter protection. Opaque plastic is generally preferred to prevent excessive heat buildup. (Glenwood Nursery and Garden Center, Richmond, VA)

Interior of plastic winter protection house. (Glenwood Nursery and Garden Center, Richmond, VA)



Shade cloth laid directly over container-grown plants for winter protection. (Lancaster Farms, Suffolk, VA)

Be cautious about investing in equipment, especially if you are short of operating capital. Consider the amount of time you will actually use the equipment; it may be desirable to lease equipment or purchase used equipment.

FINANCING THE NURSERY BUSINESS

Initial Capital Requirements

Adequate financing is a more frequent limitation to a good start in the nursery business than is know-how. Most people underestimate the investment required to start a nursery operation and the length of time needed to show a profit.

A prerequisite for obtaining adequate financing is a good understanding of both production and money management techniques needed to produce the planned crop. This requires information on what crops will be grown, how they will be grown, and how much it will cost to grow, harvest, and market them. The more detailed this information, the more useful it will be. To have confidence in you and to justify a loan to you, the lender needs organized, reliable, detailed information.

Lending institutions are often unfamiliar with nursery production and are, therefore, reluctant to provide operating capital as readily to nursery growers as to other businesses.

Most nursery crops tie up operating capital for more than one year or growing season. Some ornamental trees take 4 to 8 years to reach a salable size. For these reasons, a long-term production loan is needed. Long-term loans impose greater requirements on the grower and require the nursery to have great stability and net worth. The lender wants more and better security in the form of the operation's assets, the borrower's financial position, and a record of successful operation.

A partnership can provide another means of financing an operation. The "silent", or non-working partner, usually provides a major share of the finances. A good partnership can strengthen a firm's borrowing capacity. This partner may be a relative, friend, or other interested person. Whoever the partner, compatibility of the silent and working partners is important and cannot be taken for granted. Close relationships and friendships are easily strained or completely lost in partnerships. Many businesses fail for just such reasons. Careful thought to future buy/sell arrangements need to be made at the inception of the partnership.

Contract growing for a large grower might be a possibility. The initial cost of plants, and perhaps other production costs, might be borne or shared by the larger grower. Even more important is the assurance of a market for your stock, and the knowledge gained from working with an experienced grower. See "Contract Growing--Beware," page 19, for further discussion of this subject.

Any new business will have to deal with problems of inadequate capital. This is especially true in the nursery business where the first harvest may not occur for 2-10 years. There are several potential sources of borrowed capital.

Commercial lending institutions are the most traditional sources of capital. They tend to be conservative and prefer to secure the loan with real estate or other items that hold their value. If they provide operating capital, it will be necessary that you convince them of your ability to succeed. Previous business experience and a carefully prepared cash-flow statement may be necessary. They are also easier to deal with if your checking, savings, car loan, etc. are also handled with the same lending institution.

There are several other sources of capital that may or may not be available: friends and relatives, the Small Business Administration, the Farmer's Home Administration, the Production Credit Association, and Life Insurance Companies. Give considerable thought to the matter before dealing with friends and relatives because money matters can easily part friendships. You may find it difficult to meet the eligibility requirements of SBA, FHS, or PCA.

Starting costs can be high, depending on the size and nature of your operation. Project what your costs will be throughout the first production cycle. When making projections, be conservative on the profit side and liberal on the expenses. During the actual production, keep costs as low as possible to enhance your financial position and conserve operating capital.

A 1978 survey of nurseries producing woody landscape plants revealed that the capital investment in land, machinery, buildings, and wells was about $0.15 per square foot of production area (Starting a Wholesale Nursery Business, Circular 409A, University of Florida). Additional working capital was invested in plants and production supplies. Capital invested in these two items was about $0.76 per square foot of production area. This computes to an investment of more than $30,000 per acre for an established nursery. Much of this investment is in the nature of plant inventory, but the nursery business is capital-intensive and labor-intensive. The amount of capital you will need depends upon the size of the nursery, present facilities, level of mechanization, and types of plants you plan to produce. A detailed list of capital investment items along with estimates of annual production capital needs and projected returns should be developed before you approach lenders.

Land costs are high. Property can tie up much of your financial resources and leave little money for running the nursery business. Leased land may be a good alternative, but the lease agreement must be for a term of several years to be suitable for nursery production. Leasing land may also limit or restrict construction of greenhouses and shade structures, permanent irrigation systems,

gravel container beds, stock blocks for propagation, or growing B & B stock. There may be objections to the removal of soil and the holes from digging B & B stock.

Tractors, trucks, trailers, cultivation equipment, and other larger implements and vehicles tie up needed operating capital. In many instances, it is necessary to purchase used equipment during the establishment period. Leasing equipment may also be advantageous in some instances.

Nursery crops are intensive, requiring culture and management somewhat different from other agricultural enterprises. Lenders are not as familiar with the unique financial needs of nursery growers because the nursery industry is smaller than many agricultural industries and is concentrated among a relatively few growers.

Many new growers start small and provide their own operating capital from income earned on an outside job. They plan for the business to grow as their own financial situation improves. This permits them to learn the business with minimum risk and develop equity for a sound financial base.

Land is generally a good investment if it is well located and has good soil and plenty of good water. Good land at a high price is often a better bargain than poorer land at a cheaper price. Make sure you evaluate a potential land investment on the basis of productive acres as opposed to total acres. Also, a large tract of land is more economical to operate than smaller sections. Much time and expense can be spent on the road traveling between the separated growing areas. Land costs are actually a relatively small portion of total nursery production costs.

Although land is a relatively small cost, it does have value limits that do not justify paying prices beyond its value. Overpayment may greatly impair needed operating capital. Principal and interest must be paid, even at the expense of operating capital. It is not uncommon to see an individual who has a valuable land resource but no operating capital to establish and care for the nursery during the establishment period.

Farm land values in the area can be obtained from knowledgeable people or an appraiser. Professional appraisers, listed in the telephone directory, make land appraisals and are an excellent source of information. Check also with the County Assessor's office for recent land sales with comparable soil quality and in the general vicinity of the property in question. The County ASCS office has maps that describe soil production capabilities. Local farmers may know of sales and have knowledge of the productive potential of the land. The Federal Land Bank may inspect and appraise the loan value of a property. One may also want to visit with realtors who are familiar with farm land values. Don't buy the first farm you see. Look at as many parcels as possible before buying. By the time you look at 10 properties you will begin to

see that some are much more suitable to your specific needs than others.

Starting costs can consume relatively large amounts of capital and limit the money available for later production costs. A minimum of expenditure on land, improvements, and equipment is important if finances are limited. Payment of principal on land purchases can sometimes be deferred according to a contractual arrangement (see Sources of Capital, page 47). Seriously question each improvement and piece of equipment. For example, it may be better to purchase rooted cuttings or liners for a few years rather than tie up money in a propagation house and equipment. A minimum down payment and an extended payment schedule will probably be to your advantage during the establishment period.

Consider the purchase of an established nursery. The inventory of stock, equipment, land, improvements, and other items may be a good buy or a bad buy depending upon the circumstances. An established nursery can provide immediate sales, and possibly, a good reputation. There is no future in purchasing a depleted nursery with unsalable stock inventory, obsolete buildings and equipment, a poor design, or a poor reputation. A major disadvantage to purchasing an established nursery is the large amount of capital needed to make the purchase; but it may be to the owner's advantage to finance the purchase at terms favorable to the buyer.

Another approach is to expand or redirect an existing farm operation. A farmer seeking an alternative crop may have the necessary equipment and land and would therefore require little additional capital investment. Also, a small nursery can be a part-time operation that requires less capital investment.

Projecting Production Costs and Cash Flow

Determining anticipated production costs is necessary for budgetary and financial purposes. Production costs include both cash and non-cash outlays. Lenders are especially interested in cash outlays, and the grower must project them to make meaningful plans.

The costs of producing individual plants can be estimated from an enterprise budget once the production schedule is established. The budget is a systematic listing of all costs, including those for materials, plants, facilities, wages, and salaries associated with production of the plant crop(s) you intend to grow. Estimated plant cost allows the nursery operator to compare costs, determine selling price, and identify those plants that produce higher returns.

Cash to meet expenses such as wages, monthly utility bills, and equipment repairs must be available. Substantial cash reserve, a large cash flow from plant sales, and short-term loans are possible sources of cash to meet this need.

A monthly cash flow budget should be developed to project cash needs throughout the year. The cash flow budget is simply a written projection of the amount and timing of cash expected to flow into and out of the business during a particular time period. Cash receipts include income from plant sales, sale of capital equipment, or loans. Major cash outflows include cash operating expenses, cash purchases of capital items, and debt repayment. Managers can compare cash income and cash outflow to determine when borrowing will be required and when loans can be repaid. Scheduling of both short-term and long-term crops may be an essential management tool to insure adequate cash flow.

Growing nursery stock is one of the most costly agricultural enterprises. As the number of plants per acre is increased, the per acre production costs increase. In a container operation, investment is correspondingly greater, due to the costs of containers, growing media, and potting labor. High-density plantings can often reduce production expenses when expressed on a per plant basis.

Few nursery production cost studies are available, and fewer yet are current and up-to-date. Due to the lack of such information, you must project costs for your own planned operation.

There are many production cost factors to consider, whether growing in the field or in containers. Do not overlook or exclude any costs. The following list identifies many of the production cost factors:

- seed
- liners or other plant material
- labor for planting or canning
- growing medium
- fertilizer
- labor for applying fertilizer
- pruning labor and equipment
- staking plants (stakes, ties, labor)
- winter protection (structures, labor, heating, irrigation, etc.)
- labor for moving plants in beds, from yard for selling, etc.
- irrigation costs (water, electricity, equipment, labor for moving pipes, etc.)
- insect and disease control (pesticides, application costs, labor)
- soil fumigation (fumigant, application costs, labor)
- soil amendments (bark, sawdust, peat moss, lime, etc.)
- weed control (herbicides, application costs, labor, hand weeding, machine cultivation, etc.)
- harvesting of field stock (digging, balling, burlap, hauling from field, labor)
- labeling plants (labels, labor)
- labor for foreman and/or manager (including owner's labor)

- selling costs (transportation, loading, labor, advertising, etc.)
- depreciation on equipment
- equipment operation (labor, fuel, maintenance, repairs, etc.)
- interest on investment
- rent on land and equipment
- insurance
- telephone, electricity, water
- tools
- non-salable plants (including cost of production, disposal, labor, etc.)

Some non-production costs are:

- nursery production books, trade journals
- membership in trade associations
- attendance at meetings, short courses, trade shows

These costs must be prorated and added to production costs to get a true figure of total costs involved.

Plants propagated or grown in the greenhouse would have a comparable, although somewhat different, set of production cost items. For example, heating costs.

Visit nursery growers, suppliers, and other knowledgeable people to determine production costs. You should also check available production cost studies and gain an understanding of nursery production and the plants to be grown.

Sources of Capital

The intended use of a loan and the time-length of the loan determine, in part, the appropriate agricultural credit sources. The common loan classification is by time length -- long-term, intermediate-term, and short-term. A long-term loan is more than seven years; an intermediate-term loan is for one to seven years, while a short-term loan is for one year or less. Not all lending agencies make all types of loans. The type of loan a lender makes depends in part upon source of funds and legal restrictions.

Long-term capital is used to finance real estate (land or home) and long-term improvements. This includes buildings and equipment to be financed for 8 to 10 years or longer.

Long-term loans are supplied by a number of different financial institutions: savings and loan associations, commercial banks, insurance companies, the Federal Land Bank, the Farmer's Home Administration, and specialized investment firms. Some lenders do not consistently have money available for real estate loans.

Real estate is often financed by the seller, wherein the buyer acquires the property under a contractual arrangement. The con-

tract may include a balloon payment where interest-only payments are required for the first five years or so, before payments on the principal start. This allows the grower more money for use in production of the crop.

Short-term and intermediate-term credit, in one form or another, is needed for production or operating capital. Short-term credit is that which is needed for a year or less; intermediate-term credit extends from one to seven years.

Short-term and intermediate-term credit are usually supplied by the same sources. These include:

Commercial banks. These make all three types of loans, but are probably the best sources of short- and long-term real estate loans. Banks make both production and family-living loans. Availability of loans from banks depends in part on alternative investment opportunities for the bank, size of the bank, and reserve requirements. Farm loan policy, interest rate, and application procedures will vary among banks. Convenience is one of the advantages of borrowing from banks because the borrower is likely to have a checking account or other business with a bank in the community. Some banks have agricultural field representatives who give financial help.

Production Credit Association (PCA). These are cooperative financial institutions organized under Federal Charter as part of the Farm Credit Administration; they make only short- and intermediate-term loans. The PCA specializes in loans to agricultural producers and commercial fishermen, and is able to offer financial counseling to growers. Borrowers must become members and participate in the affairs of their association by purchasing PCA stock equal to between 5 and 10 percent of the loan. The source of PCA's loan funds are primarily loans from the Federal Intermediate Credit Banks and from business earnings.

Federal Land Bank Association (FLBA). This is another branch of the Farm Credit System, and makes real estate improvement loans that are secured by mortgages. The FLBA is restricted to lending an amount less than the appraised value of the real estate. Borrowers are required to purchase stock in the association equal to 7 percent of the loan.

Farmer's Home Administration (FmHA). This is an agency of the U.S. Department of Agriculture, and it makes all three types of loans. FmHA loans are made only to farmers who are unable to obtain credit from other agencies. Generally, a farmer is defined as one whose primary source of income is the farm or someone who possesses the training and/or experience to start a farm as a primary source of income. Only family-sized farming operations have no more than 2 fully employed persons, not including seasonal labor, are financed. FmHA borrowers usually receive the benefits of financial counsel and a closely supervised loan. The FmHA can dictate management decisions to the borrower. FmHA will also in-

sure or guarantee loans to farmers from other lenders. Joint financing with a bank or PCA is sometimes possible.

Merchants and dealers. Business firms sometimes extend short-term credit to growers for purchases of production materials and equipment. These loans are short-term except in the case of intermediate-term loans for equipment. Interest terms may vary according to the size of purchase, items purchased, amount to be financed, and other factors. The availability of credit from these sources is dependent upon the amount of retained earnings or the borrowing capacity of the merchants and dealers. Payment on purchases can sometimes be delayed for 30 to 120 days without interest charges. Interest charges are made when credit is extended for longer periods. Financial institutions do not uniformly agree on the wisdom of this source of credit, some encourage it and others do not favor it. Interest rates and terms should be investigated before deciding that credit from businesses is the best for you. Regardless of the source, remember that you will be expected to repay promptly under the terms of agreement.

Insurance companies. They provide real estate loans and real estate improvement loans. These loans must be secured with real estate mortgages. Loan funds are primarily from premium payments on policies and retained earnings. Insurance companies usually give priority consideration to loan applicants who are policy holders. These companies also consider yield and security of loans. Insurance companies are also required to make equity loans based on the paid-up value of their policies that you hold.

Private capital, provided by relatives, friends, or disinterested private parties, is often available for long- or short-term loans. There may be serious risks with such loans. Private capital should be handled strictly on a business basis.

Interest rates and terms vary among the different financial institutions. Investigate credit sources that will best serve your own situation.

Lenders don't want a borrower to divide credit among short-term lenders. An exception is when FmHA help is sought.

Obtaining a Loan

The borrower must convince the lender he or she is a good credit risk. These are the major factors the lender considers in making a loan:

Yourself. Your honesty, integrity, and ability weigh heavily. Your previous business experience, reputation, and loan repayment record are important. Good character has its rewards. Is there evidence you can grow a quality product? How much nursery experience and training do you have? Any farming experience?

Financial or net worth statement. The lender will require a detailed statement showing your financial assets and liabilities. It should reflect a realistic, if not conservative, value on all your property and investments, and it will include all that you owe, the interest, and the payment terms. Your financial or net worth statement will show the lender how secure or how risky the loan to you is likely to be. The lender is interested in minimum risk.

Financial plan (budget). Your financial plan should detail all expenses you expect to encounter in your nursery plan, and the income you expect to realize from your production. Projections for three to five years may often be necessary to prove your case. A detailed and realistic financial plan will benefit you, too, for you will have gained much knowledge in its preparation. The lender will be interested in an accounting system that will monitor your progress.

Nursery plan. The lender wants to see detailed plans on the actual or proposed growing operation, what and how much will be grown, production schedules, labor and supply needs, and other information to show that you planned your operation soundly. It is suggested that you not show a plan to grow a little of everything.

Marketing plan. Market demand for nursery stock must be defined before the business is started, Where will you sell the stock you grow? Is there a ready market for what you grow? How many outlets do you have for your stock? The lender will want to know how much you've researched the market, what you know about it (both its strengths and its limitations), and how well you've planned for it. If you seek money for expansion of your nursery operation, "test marketing" to show justification for expansion will strengthen your case with the lender. Also, the more market outlets you have, the stronger your case. Reliance on a single outlet or two puts you in a vulnerable market position unless you have a favorable contract.

Financial needs. How much money do you need and for what purpose? How much credit will come from your suppliers and how much from the lender? You should be prepared to answer these questions precisely. This should be easy if you've developed good production and marketing plans and a detailed financial plan. Your request should, of course, be realistic in terms of the security provided by your net worth and your ability to repay the borrowed money. Some lenders suggest you prepare a long-term projection, 5 years or more, of capital needs.

RULES AND REGULATIONS

Local, state, and federal regulations affect the nursery grower. Become familiar with these regulations before you make a financial commitment to enter the business.

Information on local land use regulation is available from the county or city in which the property is located. Contact either the county or city planning department.

A permit to construct a building is required throughout Virginia. Building permits are issued by the county or city building inspection office. Detailed information is available from that office.

The building plan must meet the minimum standards of the county or city building code before a permit is issued. Some local governments exempt agricultural structures, but others require a permit and minimum standards for any structure, including a garage, potting shed, greenhouse, or shadehouse.

Nursery Licensing

Any Virginia citizen or business that grows and/or sells nursery stock must be licensed with the Virginia Department of Agriculture and Consumer Services.

In order that nursery stock may move into Virginia, it must be accompanied by a valid certificate of inspection issued by the proper authority of the state of origin. This certificate must be attached to the outside of each container. The listing of your firm's name in the Director of Registered Nurserymen will be accepted as a certificate of inspection.

Registration certificates expire December 31 annually. The registration fee for nurserymen is $75.00 and for dealers is $25.00. Checks should be made payable to the Treasurer of Virginia and mailed to the attention of the Accounting Office, Virginia Department of Agriculture and Consumer Services, P. O. Box 1163, Richmond, Virginia 23209.

The out-of-state nurseryman or dealer not actually within this State is not required to register unless the state in which his stock originates requires the registration of Virginia nurserymen or dealers, in which a registration fee is required. The Virginia law authorizes reciprocal agreements.

All quarantines, federal or state, must be complied with, including those for black stem rust, gypsy moth, white pine blister rust, and tomato plant disease.

Virginia Plant and Plant Products Inspection Law

Definitions:

Agent - any person soliciting orders for nursery stock as distinguished from a nurseryman or dealer.

Dealer - any person, firm, or corporation, not a grower of nursery stock, who buys, collects wild plants, or otherwise acquires nursery stock for the purpose of reselling or distributing same. Each separate location shall constitute a dealership.

Nursery - any grounds or premises on or in which nursery stock is being propagated or grown for sale or distribution, including any grounds or premises on or in which nursery stock is being fumigated, treated, packed or stored, or otherwise prepared or offered for sale or movement to other localities.

Nursery Stock - all trees, shrubs, and woody vines, including ornamentals, bush fruits, grapevines, fruit and nut trees, whether cultivated native or wild, and all buds, grafts, scions, and cuttings from such plants. It also shall mean herbaceous plants, including strawberry plants, narcissus plants, and narcissus bulbs as the Board declares by regulation to be so included whenever it considers control of the movement of such plants or bulbs necessary to the control of any destructive plant pest. Florist or greenhouse plants for inside culture or use, unless so declared by the Board as herein authorized, shall not be considered nursery stock, except that all woody plants, whether greenhouse or field grown, if for outside planting, are hereby defined as nursery stock.

Nurseryman - any person engaged in the production of nursery stock for sale or distribution.

Plant Pest - any living stage of any insects, mites, nematodes, slugs, snails, protozoa, or other invertebrate animal, bacteria, fungi, other parasitic plants or reproductive parts thereof, viruses, or any organisms similar to or allied with any of the foregoing, or any infectious substances, which can directly or indirectly injure or cause disease or damage in any plants or parts thereof, or any processed, manufactured or other products of plants.

Virginia Plant Quarantines

Black Stem Rust Quarantine. This quarantine prohibits the planting, growing, and movement within the State of all species and varieties of barberry known to be the alternate hosts of the Black Stem Rust Disease of small grain. The movement of Berberis, Mahonias, and Mahoberberis not susceptible to the Black Stem Rust Disease is permitted, but they must be labeled as to species and variety. The quarantine further permits representatives of the

Department to destroy living plants of such varieties as Berberis, Mahonias, and Mahoberberis found growing in the State.

Gypsy Moth Quarantine. Under this quarantine the City of Alexandria, Arlington County, Clarke County, northeastern Culpeper County, Fairfax County, City of Fairfax, City of Falls Church, Fauquier County, Frederick County, Loudoun County, City of Manassas, Prince William County, northern Shenandoah County, Stafford County, Warren County, City of Winchester, a portion of Lunenburg County, and a portion of Floyd County are regulated. Regulations also prohibit the movement of certain plants, plant parts, and articles from gypsy moth infested areas of Virginia and other states to uninfested areas of Virginia without proper documents attesting to the articles' freedom from gypsy moth.

Tomato Plant Disease Quarantine. The quarantine operates to protect six Northern Neck counties of the State, and the two Eastern Shore counties from the introduction of the root-knot nematode, late blight, and collar rot. It prohibits the movement into these counties of tomato plants that have not been inspected in accordance with the regulations of the quarantine and found to be free from these plant pests.

White Pine Blister Rust Quarantine. This quarantine prohibits the dissemination, growing, or other usage of all species of currants and gooseberries in 33 mountainous counties of the State. It also authorizes representatives of the Department to enter all premises and destroy living species of currants and gooseberries found growing in these areas with certain exception. It does not authorize the destruction of cultivated species in the protected areas so long as these plants are growing 1,500 feet or more from white pine stands. European black currant plants may not be moved to any destination in Virginia.

Nursery license fees are used to provide a nursery inspection and support program for the protection of the industry and the public. The nursery inspection staff:

- inspects nursery stock for freedom of insects, diseases, and weeds;
- issues clean-stock certificates and permits for shipments;
- assists growers with prevention and control of insect, disease, and weed problems;
- services the nursery industry and "the protection thereof".

Individual nursery inspectors are assigned to geographical areas of the state. Administrative, legal, and laboratory facilities of the Virginia Department of Agriculture and Consumer Services give them support.

Nursery inspectors regularly help growers with many pest, disease, and cultural problems, and provide other useful ideas and services. Certificates and permits provided by this program enable nursery growers to legally move their products to markets throughout the United States.

Chapter 13, Article 7, Plants and Plant Products Inspection Law of the Code of Virginia, is a statute pertaining to Virginia's nursery licensing program. Personal copies can be obtained from the Division of Product and Industry Regulation, Bureau of Plant Protection and Pesticide Regulation, 1100 Bank Street, P. O. Box 1163, Richmond, Virginia 23209.

A Directory of Nurserymen and Dealers Registered to Sell Nursery Stock in Virginia and the Summary of Laws and Regulations are published annually, each spring. These publications, further information, and nursery license applications are available from the Bureau of Plant Protection and Pesticide Regulation.

Federal Plant Quarantines

Federal plant quarantine laws prevent introduction of foreign plant pests into the United States. They also restrict movements of plants, equipment, or anything else likely to carry pests from an infested or infected area to an area not infested or infected. These laws also provide for steps to be taken to eradicate the pests in the problem area.

A permit is necessary to import plants, seed, cuttings, scions, and tubers from foreign countries. Post-entry quarantine (supervised growing and inspection) may also be required for plants from countries known to have dangerous plant diseases that can be detected only in the growing plant.

To obtain an import permit and/or check the entry status of plant material, write to Permit Unit, Plant Protection and Quarantine Programs, Animal and Plant Health Inspection Service (APHIS), U.S. Department of Agriculture, Federal Building 638, Hyattsville, Maryland 20782.

Two booklets, "Facts About Importing, Shipping, or Bringing Home Foreign Plants" and "Facts About Guidelines for Importing Plant Germ Plasm," are available from the Animal and Plant Health Inspection Service. These booklets give information on regulations and buying, handling, and shipping tips.

Shipping Stock In and Out of Virginia

Each lot of nursery stock sold in or out of Virginia must be accompanied by an inspection certificate issued by the Virginia Department of Agriculture and Consumer Services, usually through a nursery inspector. These certificates testify that the plants sold are apparently free from pests and diseases.

You can save time and avoid unnecessary shipment delays by reviewing future shipping plans with your nursery inspector. Some inspection certificates can be issued in advance and be ready when needed.

Most other states honor Virginia's inspection certificate. It's important that all shipments to other states have an inspection certificate to avoid confiscation and return of the shipment at the shipper's expense.

A wall chart entitled "Regulations Governing Shipments of Nursery Plants" lists changes in state licenses and shipping requirements, state and federal quarantines and regulations, and phone numbers of state and federal regulatory offices. Copies are available at $3.00 each from American Association of Nurserymen, 1250 I Street, NW, Suite 500, Washington, DC 20005.

Importing Nursery Stock

Virginia does not maintain inspection stations. Shipments of nursery stock into the state, however, must be accompanied by valid state-of-origin nursery inspection certificates. Each shipment must be marked plainly with the contents and names and addresses of the shipper, grower, or packer. All shipments are subject to inspection.

Further information about importing nursery stock from other states and foreign countries is available from the Bureau of Plant Protection and Pesticide Regulation, 1100 Bank Street, P. O. Box 1163, Richmond, Virginia 23209 or your nursery inspector.

Collecting and Selling Native Plants/Wildflowers

Written permission of the property owner, private or public, is necessary before digging, taking cuttings, or otherwise collecting any native plant or parts of plants. Native plants can be propagated from commercial sources, grown, and sold.

The Virginia Federation of Garden Clubs, Inc. has a list of native plants needing protection, but there is no state law prohibiting digging and selling native plants if the person or firm is registered with the VDACS. Before collecting and selling native plants, contact the Bureau of Plant Protection and Pesticide Regulation, 1100 Bank Street, P. O. Box 1163, Richmond, Virginia 23209 or your nursery inspector.

Plant Patents and Variety Protection

Anyone who has invented [or discovered and] asexually reproduced any distinct and new variety of plant can apply to patent it. "Variety of plant" includes cultivated spores, mutants, hybrids, and newly found seedlings. It does not include tuber-propagated plants (specifically Irish potato and Jerusalem artichoke) and plants found in an uncultivated state.

A plant patent is granted for 17 years and guarantees the patent holder exclusive rights to the propagation and distribution of the patented plant during this time. The patent may be assigned to someone else by the patent holder, i.e., the patent holder may grant permission to others for propagation and distribution of the patented plant, for which rights royalties are commonly paid to the patent holder.

Application for a plant patent may be obtained from the Commissioner of Patents, Washington, DC 20231. Anyone wishing to patent a plant may wish to discuss the topic with the current holder of a plant patent and to contact an attorney or agent registered with the patent office. A copy of "Directory of Registered Patent Attorneys and Agents" is available from the Commissioner of Patents.

The Plant Variety Protection Act provides for a system of protection for sexually reproduced varieties; this act is administered by the Plant Variety Protection Office, U.S. Department of Agriculture. Requests for information on protection of sexually reproduced varieties should be addressed to Commissioner, Plant Variety Protection Office, Consumer and Marketing Service, Grain Division, 6525 Bellcrest Road, Hyattsville, Maryland 20782.

Other State Regulations

There are a number of Virginia regulations that benefit nursery growers without directly affecting them. All pesticides and fertilizers must be registered with the Virginia Department of Agriculture and Consumer Services. The container, package, or bag label is required to provide certain information, and the formulation must guarantee the analysis and contents given on the label.

All seed must have a label when sold. The label indicates minimum seed purity, minimum germination percent, maximum "other crop" content, and maximum weed content.

A number of regulations are concerned with employment of labor. Contact your local State Employment Commission Office or Commonwealth of Virginia Employment Commission, 703 East Main Street, Richmond, Virginia 23209; Commonwealth of Virginia Labor and Industry Department, 205 N 4th Street, Richmond, Virginia 23209; Commonwealth of Virginia Taxation Department, 2220 West Broad Street, Richmond, Virginia 23220; and your nearest Internal Revenue Service Office.

Federal and state regulations are increasingly concerned with stream water quality and with air pollution. Growers must watch their practices to prevent soil erosion and contamination of public waters by fertilizers and pesticides. Burning permits for waste products are granted in season by local fire departments.

Occupational Safety and Health Act (OSHA)

This federal law is administered in Virginia by the Labor and Industry Department, which makes inspections and enforces the law. The law protects the safety of the worker. Minimum safety standards are established, and stiff penalties may be imposed for failure to comply. The nursery grower should be thoroughly familiar with requirements of this law before hiring any labor from outside the family.

A copy of safety regulations applicable to your operation is available from Commonwealth of Virginia, Labor and Industry Department, 205 N 4th Street, Richmond, Virginia 23704.

Pesticide Applicator Certification

The federal Environmental Protection Agency (EPA) requires all growers and others who apply "restricted use" pesticides to be certified. Most nursery growers are probably using one or more pesticides (insecticides, fungicides, herbicides, or rodenticides) that may be on the EPA's restricted list. It is advisable for each grower and employer who supervises pesticide application to become certified.

This program is administered by the Virginia Department of Agriculture and Consumer Services, Pesticide, Paint and Hazardous Substance Section, P. O. Box 1163, Richmond, Virginia 23209, with certification training provided by the Virginia Cooperative Extension Service. Further information is available from the Virginia Department of Agriculture and Consumer Services or your local Extension agent.

NURSERY TRADE SUPPORT

A number of organizations, agencies, and services support Virginia's nursery industry. The nursery grower should be familiar with them and their offerings. Contact the authors of this publication for names and addresses.

Organizations

Growers should assume an active role in the industry. Some organizations relate specifically to the industry and to agriculture; they provide the opportunity to participate and give leadership to industry affairs. Growers also tend to pass helpful information by the grapevine. If you become known to the other growers, they are more apt to share helpful information.

Virginia Nurserymen's Association (VNA). The VNA is an organization of Virginia nursery growers, retailers, wholesalers, and landscapers. Their annual business meeting is in January at the Mid-Atlantic Nurserymen's Trade Show (MANTS). Officers consist of a president, vice-president, secretary-treasurer, and a full-

time employed executive director. The board is made up of nurserymen from different geographical areas in the state.

A variety of services are provided to VNA members. Legislative affairs is a major function. The VNA Certified Nurseryman program trains members for certification. A summer educational meeting and tour are arranged annually. The VNA provides scholarships and provides financial support to research projects. Committees and special task forces work on special problems.

For information about the VNA and VNA membership, write to the Association at Rt. 4, Box 356, Christiansburg, Virginia 24073.

Virginia Society of Landscape Designers (VSLD). The VSLD is an organization of individuals interested in landscape design. It sponsors educational programs and publishes a quarterly newsletter to its members. The officers are a president, vice-president, secretary-treasurer, and board members representing geographical areas.

Virginia Christmas Tree Growers Association. This organization is devoted to providing information about Christmas tree production and marketing through meetings and tours.

Area Nurserymen's Associations Within Virginia

Eastern Shore of Virginia Nurserymen's Association
Northern Virginia Nurserymen's Association (NVNA)
Richmond Nurserymen's Association (RNA)
Southwest Virginia Nurserymen's Association (SVNA)
Tidewater Virginia Nurserymen's Association (TVNA)

All area associations sponsor a two-day winter short course, and some meet monthly while others meet quarterly. These associations provide the opportunity for the exchange of production and marketing ideas.

Regional Associations and Trade Shows

Mid-Atlantic Nurserymen's Trade Show (MANTS)
P. O. Box 314
Perry Hall, MD 21128

A January trade show in Baltimore, MD, with Virginia, Maryland, and West Virginia nurserymen, firms, and nursery suppliers exhibiting their plants and supplies. No membership dues, only a registration fee to enter the trade show.

Penn Allied Nursery Trade Show (PANTS)
c/o Pennsylvania Nurserymen's Association, Inc.
1924 North Second Street
Harrisburg, PA 17102

A July trade show at Valley Forge Convention and Exhibit Center, King of Prussia, PA where nurserymen and suppliers exhibit their plants and supplies. A registration fee is required to visit the exhibit area. Many Virginia wholesale nursery growers exhibit at PANTS.

Southern Nurserymen's Association (SNA)
3813 Hillsboro Road
Nashville, TN 37215

An early August trade show held in Atlanta, GA. One can join the SNA, but it is not necessary to visit the SNA trade show. Many Virginia garden center managers and retail nurserymen attend SNA because they normally purchase plants from the south.

National Associations

American Association of Nurserymen (AAN). The AAN provides many services for nursery growers, wholesalers, and retail members. It watches over governmental legislation, is the industry's principal lobby in Washington, DC, and promotes the interests of the nursery industry to the public.

AAN membership services include group medical insurance; data processing; reference materials on nursery business topics; sales training; consulting services on employment, transportation, insurance, and retirement; promotion and marketing materials, including cooperative advertising programs; and youth educational materials. The AAN keeps members informed with weekly updates of happenings in our nation's capitol and throughout the country.

The AAN sponsors several nationwide awards programs. A number of committees actively work on industry and organization concerns. The AAN is involved in a number of federal agency activities and a variety of miscellaneous activities.

In addition to managing the many and diverse affairs of the American Association of Nurserymen, the AAN staff administers the activities of five other allied landscape industry groups.

Garden Centers of America
Horticultural Research Institute
National Association of Plant Patent Owners
National Landscape Association
Wholesale Nursery Growers of America

Information describing the organization and its activities is available from its headquarters. Write the AAN at 1250 I Street, NW, Suite 500, Washington, DC 20005.

VNA membership is not required for AAN membership but is encouraged.

International Plant Propagators Society (IPPS). The IPPS is a worldwide organization of nursery growers; researchers; Extension, teaching, and research staffs; and business people having the common interest of plant propagation. Chapters exist in the eastern, southern, and western United States, Australia, New Zealand, Great Britain, and Ireland.

Plant propagation information is shared at the annual meetings of each of the chapters and of the Society; through combined proceedings of chapter, region, and society meetings; and through a quarterly bulletin.

A unique feature of IPPS is its active membership requirement. A member must participate to maintain membership, by presenting information for publication and/or attending annual meetings. Membership is open only to individuals with five or more years experience in plant propagation. Write IPPS at Center for Urban Horticulture, University of Washington GF-15, Seattle, WA 98195 USA, for further information. Many Virginia nursery growers and Virginia Polytechnic Institute and State University Extension, teaching, and research staff are IPPS members and can also provide information.

Where To Go For Help

Virginia nursery growers can turn to a number of sources when help is needed. Some references are listed below, and additional references are listed in the Appendices.

Nurseries and Related Industries. Other nursery growers are a major source of help. The diversity of the industry insures a wide range of knowledge and experience. Nursery growers tend to be friendly and generous, and most are eager to help a fellow grower.

A wealth of knowledge and experience exists among those businesses who supply and service Virginia's nursery industry. Many have special training in their fields. Nearly all have experience working with growers, and some have growing experience themselves.

Lenders, accountants, management specialists, and others are sources of help on business and financial matters. Agricultural consultants are also available.

Virginia Department of Agriculture and Consumer Services. Nursery inspectors, employed by the Virginia Department of Agriculture and Consumer Services, are legally charged with responsibility to assist growers with their problems (see Rules and Regulations, Nursery Licensing). All are trained in ornamental horticulture or a related field and have experience in working with growers. Entomologists, plant pathologists, nematologists, and pesticide specialists all provide support services.

The name and address of the nursery inspector for any area of Virginia is available from the Division of Product and Industry

Regulation, Plant Pest Control Section, 1100 Bank Street, P. O. Box 1163, Richmond, VA 23209.

Virginia Cooperative Extension Service. The Virginia Cooperative Extension Service extends information from Virginia's land-grant universities, Virginia Tech and Virginia State, to the citizens of Virginia. Extension agents are located in each county and certain cities in the state. Several localities are served by an Extension agent who specializes in ornamental horticulture.

Extension agents are supported by Extension specialists located at the universities. Supportive specialists include those in ornamental horticulture, tree fruits and nuts, small fruits, vegetables, soils and fertility, turf, irrigation, plant diseases, pest management, marketing, economics, and agricultural engineering. The diagnostic Plant Disease Clinic and Soils Testing Laboratory at Virginia Tech are supervised by the specialist staff.

The Virginia Cooperative Extension Service, through its Extension agents and specialists, provides educational programs for nursery growers and assists them with various problems and concerns, based upon research conducted in Virginia and other states. The "Virginia Tech Nursery and Grounds Topics" newsletter is written especially for nursery growers and grounds maintenance personnel. It is available through your Extension Horticulturist, Nursery Production in your local Extension Office.

Research Services. Two research facilities in Virginia are geared to the nursery and allied industries.

Virginia Polytechnic Institute and State University's Agricultural Experiment Station has a number of research projects in horticulture, plant pathology, entomology, soils, agricultural engineering, and agricultural economics. Research of interest to nursery growers is conducted at the university in Blacksburg.

The Hampton Roads Agricultural Experiment Station, 1444 Diamond Springs Road, Virginia Beach, VA 23455, researches problems of the Tidewater nursery industry. Emphasis is on physiology, insect, disease, and weed identification and control, container production, introduction of new plants and the maintenance of an arboretum of plants grown by Virginia nursery growers.

The investment in research is long-term. The Virginia Cooperative Extension Service is responsible for interpreting research results and making them useful to the grower.

Trade Publications

Several publications specialize in serving the ornamentals industry and provide useful information to the trade.

American Nurseryman. A bi-weekly trade journal featuring culture and marketing of nursery crops and trade news. American

Nurseryman Publishing Company, 111 N. Canal Street, Chicago, IL 60606-7203.

Greenhouse Manager. A monthly trade journal featuring greenhouse construction, management, greenhouse crop production and marketing, and trade news. Branch-Smith Publishing, 120 St. Louis Avenue, Fort Worth, TX 76104.

Grounds Maintenance. A monthly magazine concerned with landscape maintenance and design, equipment, and trade news. Intertec Publishing Company, 1014 Wyandotte Street, Kansas City, MO 64105.

Grower Talks. A monthly magazine devoted to greenhouse management and greenhouse crop production information. Geo. J. Ball Company, 250 Town Road, West Chicago, IL 60185.

Interiorscape. A semi-monthly magazine published for the interiorscaping industry. Brantwood Publications, Inc., Northwood Plaza Station, Clearwater, FL 33519-0360.

Interior Landscape Industry. A monthly publication for the interior landscape industry. American Nurseryman Publishing Company, 310 South Michigan Avenue, Chicago, IL 60604.

Landscape Management (formerly Weeds, Trees, and Turf). A monthly magazine for the "vegetation care industry" and related fields (landscape maintenance, turf management, sod production, tree care, pest control, trade news). Harcourt Brace Jovanovich Publications, Circulation Offices, 1 East First Street, Duluth, MN 55802.

Nursery Business. Published monthly, this magazine features the business side of nursery operations, industry viewpoints, and trade news. Brantwood Publications, Inc., Northwood Plaza Station, Clearwater, FL 33519-0360. Grower Edition and Retailer Edition alternate months.

Nursery Manager. A monthly publication providing information for the nursery grower, retailer, and garden center manager. Of particular interest to those in the South. Branch-Smith Publishing, 120 St. Louis Avenue, Fort Worth, TX 76101.

Pacific Coast Nurseryman and Garden Supply Dealer. A monthly magazine providing industry news of interest to western nursery growers; many articles include information on cultural practices. Cox Publishing Company, 832 South Baldwin Avenue, Arcadia, CA 91006.

CONCLUSIONS

The future of the nursery business in Virginia appears excellent at this time. It has been estimated that Virginia is producing only about one-third to one-half of the nursery stock being sold

in the state. Many plants are transported all the way from the west coast, and from Oklahoma, Georgia, Alabama, Tennessee, and Florida. Florida also ships significant quantities of foliage plants, shrubs, and trees to Virginia each year. But, large B & B plant material cannot be economically shipped over long distances and seems to be continuously in demand.

Several Virginia nurseries are expanding, especially container nurseries, to meet the nursery stock demand. Also, several new nurseries have been established in Virginia within the last ten years.

There is a high risk factor in almost every phase of the nursery business. For example, container plants are more susceptible to cold injury than those growing in the ground, since cold air can circulate around the container and easily damage the plant's root system. To have any insurance against this type of damage, costly precautions must be taken. However, these increased production costs may be offset by lower transportation charges required for locally-grown stock.

Market demand has been excellent in recent years, but it should be remembered that in periods of recession and national emergency nursery products are considered luxury items and may be among the first to suffer. Although not a problem at present, overproduction and domination of the industry by large producers are possibilities.

The nursery business offers an interesting potential for qualified, hard-working people. Established firms in both the nursery and greenhouse industries are always looking for good help. While the starting pay scale is usually the minimum allowed by law, it is comparable to other agricultural industries. Valuable experience can be gained by working for a reputable grower for several years before starting your own business. There is ample opportunity for individuality and satisfaction in producing or selling products that can improve our environment.

APPENDIX A

Conversion Factors for U.S. and Metric Equivalents

	When You Know	You Can Find	If You Multiply By
LENGTH	inches	millimeters	25.4
	inches	centimeters	2.54
	feet	centimeters	30.5
	feet	meters	0.305
	yards	meters	0.91
	miles	kilometers	1.609
	millimeters	inches	0.04
	centimeters	inches	0.39
	meters	inches	39.37
	meters	yards	1.094
	kilometers	miles	0.62
AREA	square inches	square centimeters	6.45
	square feet	square meters	0.09
	square yards	square meters	0.836
	acres	hectares (square hectometers)	0.405
	square centimeters	square inches	0.155
	square meters	square yards	1.19
	hectares (square hectometers)	acres	2.471
WEIGHT	ounces	grams	28.350
	pounds	kilograms	0.454
	grams	ounces	0.035
	kilograms	pounds	2.205
LIQUID VOLUME	ounces	milliliters	29.57
	pints	liters	0.473
	quarts	liters	0.946
	gallons	liters	3.785
	milliliters	ounces	0.034
	liters	pints	2.114
	liters	quarts	1.057
	liters	gallons	0.264

CUBIC VOLUME	cubic inches	cubic centimeters	16.387
	cubic yards	cubic meters	0.765
	cubic centimeters	cubic inches	0.061
	cubic meters	cubic yards	1.308
TEMPERATURE	degrees Fahrenheit	degrees Celsius	5/9 (after subtracting 32)
	degrees Celsius	degrees Fahrenheit	9/5 (then add 32)

METRIC MEASUREMENT ABBREVIATIONS

millimeters	- mm	milliliter	- ml
centimeters	- cm	liter	- l
meter	- m	cubic centimeter	- cc
kilometer	- km	gram	- g, or gm
hectare	- ha	kilogram	- kg
Celsius	- C		

APPENDIX B

Glossary of Nursery Terms

Acaricide -- a chemical to control mites such as "red spiders".

Aerated Steam -- a form of steam used for the sterilization of soils and planting mediums; free-flowing steam is injected into a stream of air that reduces the steam temperature to 160¬%F (57¬%C) to permit survival of desirable organisms while killing most soil pests.

Annual -- a plant that lives for only one growing season, completing its life cycle from seed to seed in one season.

Artificial Mix -- same as soilless mix.

Asexual Propagation -- production of new plants from shoot, stem, leaf, or root pieces (by cuttings, division, layering).

B & B -- same as Balled and Burlapped.

Bactericide -- a chemical to control bacterial diseases.

Balled and Burlapped -- refers to plants dug with roots inside soil roughly in shape of a ball, this root-ball then is wrapped tightly in burlap to keep the root-ball from breaking apart when handled.

Bare-root Stock -- nursery stock with little or no soil on roots; soil is allowed to fall or is removed from roots while digging.

Bed -- an area for growing plants, either outdoors or in greenhouses; or a ground-level area (bed) in a greenhouse, used for propagation and/or growth of plants.

Bench -- a table of wood, concrete, or other material, used for propagation or growing plants; with sides, a bench is filled with medium in which cuttings are stuck or plants are grown; without sides, a bench supports cuttings or plants in flats, containers, or pots filled with medium.

Biennial -- a plant that lives for two growing seasons and then dies; or an annual plant that requires exposure to winter temperatures before flowering and setting seed.

Bottom Heat -- warming of propagating medium to a temperature above that of the ambient air; most commonly provided by electric heating cables in or under medium or by hot water or steam heat under the propagation bench.

Broad-leaved or Broad-leafed -- plants that have wide leaves rather than the narrow leaves ("needles") of conifers; a term used in the nursery trade to distinguish between conifers and non-conifers.

Broad-leaved Evergreens (BLE) -- broad-leaved plants that retain green leaves year round.

Bud-grafting -- same as Budding.

Budding -- joining a small piece of bark (and sometimes wood) having a single bud onto the trunk, branch, or twig of a rooted plant so the single bud grows a new preferred plant.

Caliper -- diameter of plant's main stem (trunk) measured at 6 inches above ground where trunk is 4 inches or less in diameter and 12 inches above ground for larger sizes; the determining measurement in nursery stock grading; usually applied to trees and commonly expressed in inches.

Callus -- mass of cells that develop from and around wounded plant tissues, such as base of cuttings and at junction of graft union; an important step in healing process.

Can -- same as Container.

Can Yard or Container Yard -- the outdoor area in a nursery where container stock is grown.

Canning -- process of planting a plant in a can or container.

Cold frame -- a narrow (about 6 feet wide), low (about 2 feet high) structure with wood or concrete sidewalls and polyethylene, fiberglass, or glass sash cover that permits light to enter; used to start or harden plants.

Coniferous Evergreens -- evergreen conifers.

Conifers -- narrow-leaved (needle-leaved) plants that produce seeds in cones; most conifers are evergreens; includes pines, spruces, firs, cedars, cypresses, false cypresses, yews, hemlocks, redwoods, and ginkgo.

Container -- a metal, plastic, or paper-mache container in which nursery stock is grown and sold.

Culls -- undesirable or inferior plants; a relative term because a cull to one person may be a desirable plant to another.

Cultivar -- plants that are true to type when grown from seed or vegetative propagation; a horticulturally derived variety as distinguished from a natural variety; commonly called "variety".

Cutting -- a portion of a stem, leaf, or root that, when placed in a medium, will grow roots and into a new individual plant.

Deciduous -- refers to perennial plants that lose their leaves in fall or whose tops die down during winter.

Defoliation -- the dropping or shedding of leaves by plants.

Division -- process of cutting a clump-type of plant into sections.

Dormant -- a term applied to plants or seeds that are in a state of rest, alive but not growing.

Egg Can -- a metal container of 6 1/2 gallon capacity, made for and available from food processors, often used to grow nursery stock.

Evergreen -- refers to perennial plants whose leaves remain green throughout the year.

Field Growing -- method of growing nursery stock directly in soil in the field as opposed to growing in containers.

Full -- refers to a plant that is well-branched and heavy-foliaged.

Fumigants -- chemicals used to fumigate soils, media, or plants; fumigants come in a liquified or solid form, becoming a gas, vapor, or smoke when released or ignited.

Fumigation -- the killing of insects, diseases, weeds, nematodes, and other organisms with a gas, smoke, or vapor.

Fungicide -- a chemical that controls fungus diseases.

Gallon Can -- a metal or plastic container of approximately one gallon capacity.

Grading -- classifying plants according to quality or size.

Grafting -- a method of propagation where a stem portion, with two or more buds, of one plant is joined with another plant, having roots, to form one new plant; joining a scion with the trunk, branch, or twig of a rooted plant.

Greenwood Cuttings -- a term usually used to describe softwood cuttings, but occasionally used to designate semi-hardwood cuttings.

Ground Cover -- a low-growing, spreading plant.

Growing Medium -- a soil mix, soilless artificial mix, or pure material (such as peat moss or bark dust) used for growing plants;

media is the plural of medium and refers to more than one growing medium.

Growing On -- term applied to plants that are to be grown in the nursery until they reach larger sizes or desired shapes.

Growing Season -- usually refers to the period from spring into fall, when plants are not dormant.

Harden-off or Hardening-off -- exposing plants to low or varying temperatures, less humid or drier conditions, or other unaccustomed growing conditions to acclimate them to more difficult growing conditions, such as outdoors or away from mist irrigation; to toughen plants so that they can withstand handling and/or less desirable conditions.

Hardy Plants -- a relative term applied to plants that can withstand the cold and other weather conditions in the area where they are to be grown; a hardy California plant may not be hardy in Oregon, and a plant hardy in Oregon may not be in Minnesota.

Head-back or Heading-back -- making a pruning cut halfway down a shoot to stimulate growth from buds on side branches just below the cut; long, slender branches and leaders are often headed-back to produce a more compact plant; produces the opposite effect of thinning.

Heeling-in -- temporarily placing newly dug stock in a trench or sawdust pile, with roots covered with moist sawdust, soil, peat, or shingletow.

Herbaceous Cuttings -- stem cuttings from herbaceous plants such as geraniums, chrysanthemums, Coleus, and poinsettias.

Herbaceous Perennials -- non-woody plants that live for two or more years.

Herbicide -- a chemical that controls weeds.

Hotbed -- similar in structure to a cold frame, but the soil or growing medium is heated by electric cable, steam, or hot water.

Insecticide -- a chemical that controls insects.

Layer -- a layered stem; see Layering.

Layering -- rooting a stem by placing it partially underground or in rooting medium while it is still attached to its parent plant.

Leach -- to dissolve and wash fertilizer, plant nutrients, salts, and other soluble materials out of a soil or growing medium.

Leader -- the dominant, central branch of a tree or tree-like shrub.

Leggy -- refers to a plant that is unattractive because it is not leafed-out at its base, leaving trunks or branches bare and exposed.

Liner(s) -- young plants of suitable size that are planted in rows (lines) in the field or in containers and grown to the desired saleable size.

Lining-out -- transplanting nursery stock into rows in the field.

Lining-out stock -- same as Liner(s).

Media -- the plural of medium, referring to more than one medium.

Medium -- the material in which plants are propagated or grown; see Growing Medium.

Mist Propagation -- propagation from cuttings, grafts, or seed where an intermittent water mist is used to maintain moisture and high humidity to enhance rooting, germination, and/or growth.

Miticide -- same as Acaricide.

Mother Block -- a group of stock plants maintained for propagation, most commonly to provide cuttings or scions.

Node -- the position on a stem where leaves and buds are located.

Nursery -- a business firm that propagates, grows, and sells trees, shrubs, vines, flowering plants, fruit plants, and/or succulents.

Peat Balling -- the practice of placing or wrapping bare-root plants in peat for shipping and/or selling.

Perennial -- a plant that lives for three or more years.

Pinching -- removing (literally, with thumb and forefinger) the top of a twig, shoot, or branch, or bud at its tip, to encourage growth of side shoots for a more dense growth of the plant.

Pot-bound -- condition when the roots of a plant in a container begin to wrap around or entwine the root ball.

Pots -- small containers made of clay, plastic, paper mache, or other materials, and used for growing cuttings, seedlings, and, generally, other small plants.

Potting -- process of putting a plant into a pot or container.

Propagation -- producing new plants from parts (cuttings, layers, divisions, grafts, buds, tissue, bulbs, tubers, rhizomes, corms) of whole plants, or from seeds.

Pruning -- cutting or pinching-out dead or living plant parts to improve the health, safety, size, or shape of a plant.

RCT -- a root cutting transplanted.

Retailer -- one who sells directly to consumers.

Root Ball -- with container plants, the root system plus the growing medium in which it is growing; with B & B plants, the root system plus the attached soil that was dug out of the ground with it (as a unit) and wrapped with burlap.

Root Pruning -- cutting the roots of field-grown plants to induce a more compact root system so there will be less root loss when the plant is removed for sale and/or transplanting.

Rooted Cutting (RC) -- a cutting that has grown new roots.

Rooting Compound -- a chemical that promotes and hastens the rooting of cuttings.

Rooting Hormone -- same as rooting compound.

Rootstock -- same as Understock.

Scarification -- a mechanical or acid treatment applied to certain seed to break or open up the hard, impervious seed coat and permit seed germination.

Scion (CION) -- the short piece of detached shoot with dormant buds, which, when grafted onto a plant, is the upper portion of the graft and from which will grow the stem or branches, or both, of the grafted plant.

Seedling -- a small plant grown from seed.

Semi-hardwood Cuttings -- stem cuttings taken during summer from partially matured wood of new shoots just after a flush of growth has taken place.

Sexual Propagation -- production of new plants from seed.

Shear or Shearing -- use of hedge shears, grass shears, or pruning shears or knives to clip leaves, stems, or branches; has the effect of increasing plant density; often used in the nursery to shape plants and increase compactness.

Shifting -- moving a plant from a smaller container to a larger one, such as from a one gallon to a three gallon.

Shingletow -- long, thin wood shavings.

Softwood Cuttings -- stem cuttings from the soft, succulent, new spring growth.

Soil Mix -- a mixture of soil and sand, peat, or other combinations of inorganic and/or organic materials used for growing plants.

Soil Sterilization -- applying a chemical (soil sterilant) to a soil to prevent plant growth (especially weeds) for one to three years.

Soilless Mix -- a mixture of peat, bark dust, perlite, vermiculite, lava rock, or other inorganic or organic materials, but without soil.

Soluble Salts -- a chemical compound that can be dissolved in the soil solution.

Steam Pasteurization -- a heat treatment, usually with 160°F (57°C) aerated steam, for selective control of insects, diseases, nematodes, and most weeds.

Steam Sterilization -- a heat treatment, using 212°F (100°C) steam, of growing medium before planting to kill weed seeds, insects, diseases, nematodes, and other organisms.

Sticking -- placing cuttings into propagation medium; "stuck" cuttings are those that have been placed into propagation medium.

Stock -- nursery plants for sale.

Stock Plant -- one from which new plants may be propagated.

Stratification -- a seed treatment to provide exposure to low temperatures that is often needed to break dormancy and bring about prompt and uniform seed germination.

Succulents -- plants with fleshy leaves and stems; most popular genera are Aloe, Crassula, Echeverria, Haworthia, Sedum, Sempervivum, and the various cacti.

T or X -- refers to plants transplanted once.

TT or XX -- refers to plants transplanted twice.

Transplant -- a young plant ready for planting into a larger container or into a field.

2-0, 2-1, 2-2, etc. -- used to describe seedlings; the first number indicates age in years, the second indicates the number of times transplanted.

Two-gallon Can -- a container of approximately 2 gallon capacity; containers may also be of other sizes, such as 3- or 5-gallon.

Understock -- the lower portion of a budded or grafted plant, including its root system.

Vegetative Propagation -- same as Asexual Propagation.

Wholesaler -- one who sells to retailers; one who does not sell directly to consumers.

Yard -- used when referring to a quantity of soil or growing medium, an amount equal to a cubic yard; often used in conjunction with a growing area, such as "container yard", a place where plants are grown in containers.

APPENDIX C

Sources of Nursery Supplies and Services

These source lists consist of Virginia or nearby firms that specifically serve or provide special services to the nursery industry. While these lists are believed to be currently accurate, changes do occur and accuracy is not guaranteed. Listing a firm does not imply endorsement, guarantee, or warranty of that firm or of its products or services. Omission of any Virginia firm is unintentional and does not imply inacceptance or disapproval.

Supplies

The following suppliers serve Virginia's nursery and greenhouse industries. Many local farm supply businesses can provide certain chemicals, equipment, fabrics, fertilizers, media, and plastic to nursery growers.

Arett Sales Corp., P. O. Box 3540, Cherry Hill, NJ 08034
Complete line of nursery and greenhouse tools and supplies

Brawley Seed Co., P. O. Box 180, 1010 N. Main, Mooreville, NC 28115
Seeds and horticulture supplies

Caretree Systems, 160 Outerbelt Street, Columbus, OH 43213
Tree diggers

Cornell Chemical and Equipment Co., Inc., 712 Evelyn Ave., Linthieum Heights, MD 21090
Nursery chemicals

Dayton Bag and Burlap Co., Drawer 8, Dayton, OH 45401
Burlap and supplies for field growing

Ethyl Corporation, 330 S Fourth Street, Richmond, VA 23210
Plastic for greenhouse covering, winter protection, and mulching

Geiger Supply Co., Rt. 63, Box 285, Harleysville, PA 19438
Complete line of nursery and greenhouse supplies (chemicals, containers, equipment, fabrics, fertilizers, plastics)

Good-Prod Sales, Inc., 825 Fairfield Ave., Kenilworth, NJ 07033

Greenlife Products Co., West Point, VA 23181
Bark, media, and mulching materials

Harper-Crawford Bag Co., Inc., P. O. Box 32367, Charlotte, NC 28232
Burlap, shadecloth

Hendrix and Dail, Inc., Box 631, Greenville, NC 27834
Soil fumigation

A. H. Hummert Seed Co., 2746 Chouteau Ave., St. Louis, MO 63103
Horticultural supplies (greenhouse, nursery, chemicals, seeds, plants, plastics)

A. M. Leonard, Inc., Piqua, OH 45356
Horticultural tools and supplies

Sta-Green Plant Food, 4694 Haygood Point Court, Virginia Beach, VA 23455
Nursery fertilizer

Stanard Bag and Burlap,2109 Stockton Street, Richmond, VA 23224
Burlap

George W. Tait & Sons, Inc., 900 Tidewater Drive, Norfolk, VA 23504
Nursery and greenhouse supplies and chemicals

Vermeer Sales & Service, Inc., P. O. Box 207, Annapolis Junction, MD 20701
Tree diggers

The Wetsel Seed Co., Inc., P. O. Box 791, Harrisonburg, VA 22801
Chemicals, containers, equipment, fertilizers, media, plastics, seeds

Zarn, Inc., P. O. Box 1350, Reidsville, NC 27320
Containers

<u>Soil and Foliar (Leaf Analysis) Labs Currently Serving Virginia Nursery Growers</u>

A & L Agricultural Laboratories, Inc., 7621 Whitepine Road, Richmond, VA 23234
Soil, foliar, water, seed

Soil Testing Laboratory, Virginia Polytechnic Institute and State University, Blacksburg,VA 24061
Soil, foliar

Virginia Truck and Ornamentals Research Station, 1444 Diamond Springs Road, Virginia Beach, VA 23455
Soil

Nursery Seed Sources

Clyde Robin, P. O. Box 2091, Castro Valley, CA 94546

F. W. Schumacher Company, Sandwish, MA 02563

Herbst Brothers Seedsmen, Inc., 1000 N. Main Street, Brewster, NY 10509

APPENDIX D

Suggested Reading

American Standard for Nursery Stock. 1986. American Association of Nurserymen, Washington, DC. 30 pages. A bulletin giving size and grade specifications and terminology commonly used in marketing nursery stock; illustrations and layout make it especially useful for new growers.

Ball Red Book. 1984. George J. Ball, Inc., West Chicago, IL. 14th edition. A book devoted mostly to growing bedding plants and flower crops, but with good discussions of greenhouse coverings, heating, ventilation, cooling; soilless mixes; air pollution; fumigation and sterilization of soil; insect and mite control; nutrition; fertility; and soil testing.

Beginning in the Nursery Business, by John J. Pinney. 1984. American Nurseryman, 111 N. Canal Street, Suite 545, Chicago, IL 60606-7203. Fourth edition. This book discusses retail salesyards, garden centers, landscape, mail order, agency nurseries, container-grown stock, financing, and record keeping aspects of the nursery business.

Checklist of Woody Ornamental Plants of California, Oregon, and Washington, by Elizabeth McClintock and Andrew T. Leiser. 1978. Agricultural Sciences Publications, University of California, Berkeley, CA. 120 pages. A comprehensive listing of woody plants grown in the West; useful in providing proper plant nomenclature.

Commercial Production of Climbing Plants, by Phillip McMillan Browse. Timber Press, 9999 S.W. Wilshire, Portland, OR 97225. 178 pages. A book devoted exclusively to the practical needs of the commercial grower.

Container Growing, by James M. Patterson. 1969. American Nurseryman, 111 N. Canal Street, Suite 545, Chicago, IL 60606-7203. 174 pages. A compilation of stories that appeared in American Nurseryman magazine about starting in the nursery business, organizing the operation, container production methods, and managing the nursery business. Many useful ideas and considerations, written by an experienced nursery grower.

Container Nursery Design by Bonnie Appleton. American Nurseryman, 111 N. Canal Street, Suite 545, Chicago, IL 60606-7203. Covers the principles of designing or modernizing a container nursery. Topics include site selection, creating a plan of attack, land preparation and bed design, irrigation systems, structures, work and storage areas.

The Container Plant Manual. by John Edmonds. 1980. Timber Press, 9999 S.W. Wilshire, Portland, OR 97225. 172 pages. A thorough, complete guide to the commercial production of container-grown stock.

The Garden Centre Manual, by Ian Baldwin and John Stanley. 1983. Timber Press, 9999 S.W. Wilshire, Portland, OR 97225. 250 pages. A complete management guide for the retailer of garden products.

Hardy Woody Plants From Seed, by Phillip McMillan Browse. 1979. Timber Press, 9999 S. W. Wilshire, Portland, OR 97225. 165 pages. A thorough, practical book that guides the grower in the profitable and successful propagation and growing of woody plants from seed.

New Pronouncing Dictionary of Plant Names. 1984. American Nurseryman Publishing Company, 111 N. Canal Street, Suite 545, Chicago, IL 60606-7203. 63 pages. An alphabetical listing of botanical names, with suggested pronunciations and brief definitions or origins of the names.

The Modern Nurseryman, by John Stanley and Alan Toogood. 1981. 412 pages. Faber and Faber Limited, London, England. Covers all aspects of nursery stock production.

Nursery Management-Administration and Culture, by Harold Davidson and Roy Mecklenburg. 1981. 450 pages. Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. An introductory text for students and others interested either in starting or managing a nursery.

Nursery Stock Manual, by J. G. D. Lamb, J. C. Kelly, and P. Rowbrick. 1975. Grower Books, London, England. 298 pages. A book for nursery growers on planning the nursery operation, financing the business, marketing, growing of young stock, soils and fertility, and mostly, propagation.

Plant Propagation Practices, by James S. Wells. 1955. The MacMillan Company, New York, NY. 344 pages. A book written by an eastern U.S. nursery grower; sections deal with setting up and equipping a propagating unit, basic propagation principles and procedures, and information on propagation of a select group of plants.

Plant Propagation Principles and Practices, by Hudson T. Hartmann and Dale E. Kester. 1983. Prentice-Hall, Inc., Englewood Cliffs, NJ. 727 pages. Fourth edition. An authoritative treatment of many aspects of propagation: structures, media, fertilizers, containers; seed propagation; physiology and techniques of propagation by cuttings, grafting, budding, and layering; propagation by specialized stems and roots; micro-propagation; and propagation of selected plants.

Practical Woody Plant Propagation for Nursery Growers, by Bruce Macdonald. Timber Press, 9999 S.W. Wilshire, Portland, OR 97225. 660 pages. A comprehensive book on plant propagation oriented to the practical needs of professional nurserymen. Growing plants from seed to various methods of cuttings, graftings, layering, and

tissue culture are all covered in detail. Extensive information on facilities, climates, soil media, equipment, etc. is included.

Reference Manual of Woody Plant Propagation: From Seed to Tissue Culture, by Michael Dirr and Charles W. Heuser. 1987. Varsity Press, Inc., P. O. Box 6301, Athens, GA 30604. 350 pages. Offers propagation information on 1,100 species based on research, the authors' observations, and discussion with nursery producers and propagators. Chapters are also included which explain propagation techniques for seed, cuttings, budding, grafting, and tissue culture.

Seeds of Woody Plants in the United States. 1974. Agriculture Handbook 450, Forest Service, U.S. Department of Agriculture, Washington, DC. 883 pages. A comprehensive treatment of seed propagation with sections on seed biology; genetic improvement of seed; seed production; harvesting, processing, and storage of fruits and seeds; presowing treatment of seed; seed testing; and tree seed marketing controls. Mostly devoted to specific handling methods for seeds of 188 genera of woody plants.

Virginia Nurseryman Training Manual. 1983. Virginia Nurserymen's Association. A looseleaf notebook with 20 chapters of information on plant growth, gardening, landscaping, and selling; written for the retail nursery industry but of interest to the nursery grower. Available from Virginia Nurserymen's Association, Rt. 4, Box 356, Christiansburg, VA 24073.

Your Future in the Nursery Industry, by John J. Pinney. 1967. Richards Rosen Press, New York, NY. 160 pages. This book discusses the requirements, opportunities, rewards, and disadvantages of a nursery career.

Environmental Plant Production and Marketing, by Tokuji Furuta. 1974. Cox Publishing Company, 832 South Baldwin Avenue, Arcadia, CA. 232 pages. This book deals with nursery organization and layout, plant growth needs, growth regulation, soils, fertilizers, irrigation, mechanization, management, and marketing.

The Greenhouse Environment, by John W. Mastalerz. 1977. John Wiley & Sons, New York, NY. 629 pages. A textbook written for students interested in greenhouse management; of interest to nursery growers with discussions of greenhouse operation, growing media, watering, and nutrition.

Greenhouse Management for Flower and Plant Production, by Kennard S. Nelson. 1980. The Interstate Printers and Publishers, Inc., Danville, IL. 252 pages. Written primarily for greenhouse managers, this book discusses basic principles of management, business, greenhouse engineering and maintenance, greenhouse crop rotation and scheduling, soils and fertility, lighting, heating, ventilation, and marketing.

How Plants Get Their Names, by L. H. Bailey. 1933. Dover Publications, Inc., New York, NY. 181 pages. Re-publication of original edition. A discussion of naming plants; includes pronunciation suggestions and meanings of botanical names.

Sources of Books

There are many books available, and more are being published. Excellent sources for books are:

American Nurseryman
111 N. Canal Street, Suite 545
Chicago, IL 60606-7203

ISBS - Timber Press
9999 S.W. Wilshire
Portland, OR 97225

Branch-Smith Publishing
Reader Service Dept.
P. O. Box 1868
Fort Worth, TX 76101

Brantwood Publications, Inc.
Northwood Plaza Station
Clearwater, FL 33519-0360

In addition to the references listed, both Sunset Books and Ortho Books have excellent paperback books on a variety of horticultural and gardening topics. These can also be purchased through your local bookstores and garden centers or stores.

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