

UNIT I: THE GREENHOUSE INDUSTRY

Lesson I: Scope and Development of the Greenhouse Industry

This unit examines the greenhouse industry from two broad perspectives: its growth and development and its various career opportunities. Lesson 1 defines the four areas of horticulture and then traces the historical progress of the greenhouse industry. It addresses developments in the industry and examines the economic importance of greenhouse-grown cultivation in Missouri, the United States, and in several countries throughout the world.

Areas of Horticulture

The term “horticulture” was originally derived from the words “garden” and “cultivate.” The word has evolved to mean “the cultivation of plants.” Horticulture is made up of four areas. Floriculture is the cultivation of flowers (cut flowers, bedding plants, foliage plants, and potted plants). Olericulture entails growing vegetables. Ornamental horticulture involves growing plants solely for their beauty (annuals, perennials, shrubs, ground cover, landscaping). (Floriculture is actually an aspect of ornamental horticulture, but it is considered here as a separate field because greenhouses typically focus on producing flowers.) The last area is pomology - growing fruit and nuts.

History of the Greenhouse Industry

Cultivating various types of plants is an age-old custom. Humanity’s connection with plants began in ancient Greece with Theophrastus (377-288 BC) who had a keen interest in the natural world. His investigations resulted in discovering that plant roots absorb nutrients. Without actually knowing their scientific names, he discerned the differences between monocotyledons and dicotyledons (discussed in Unit III, Lesson 1). He also experimented with pruning roots and thereby

concluded that this procedure encouraged flowering and fruit development.

Centuries later during the Roman Empire, Varro (116-20 BC) adapted Theophrastus’ insights and discovered that using legumes in the soil improves its quality. He demonstrated that fruit could be stored after harvest when placed in straw and stored in a cool place. In 77 AD, Dioscorides wrote *De Materia Medica* in which he described roots, stems, leaves, and flowers in great detail. This was considered the authoritative text on plant science for the next 1,500 years.

Greenhouses, however, did not appear until 30 AD, thanks to Roman emperor Tiberius whose doctor prescribed that he eat one cucumber daily. Although glass was not even invented at that time, Tiberius’ gardeners could grow cucumbers out of season by placing the seeds in large pots and covering them with sheets of mica, a transparent mineral. This rudimentary form of a greenhouse was known as a *specularium*.

By the 13th century, interest in plant growth took an unfortunate turn when a Dominican monk, Albertus Magnus, was charged with witchcraft for tampering with the natural order by trying to force blooms out of season.

The first working greenhouse was built in 1599 in Holland. Throughout Europe, fascination with exotic fruit (oranges, pineapples, and dates) prompted further interest in constructing more hothouses that could nurture such delicacies. During the 17th century, the French built “orangeries” to cultivate the newly exported treat, oranges. At the French palace Versailles, a huge orangery was built that was 500 feet long, 42 feet wide, and 45 feet high. Its southern exposure flooded the growing plants with heat and light.

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In 1737, wealthy Bostonian, Andrew Faneuil, built the first U.S. greenhouse, mostly to cultivate fruit. Many years later, George Washington, who loved pineapples, built a “pinery” at Mt. Vernon. But it was during the 19th century in England that production of greenhouses expanded most fully. Glass was then easily available for constructing these buildings, which were exclusively owned by the wealthy. By 1825, greenhouses were common.

During the 1950s, improvements in transportation allowed growers to reach broader markets. New building materials became available. In 1960, greenhouses were made from film plastic and galvanized steel. Noteworthy botanical greenhouses were built during that decade: the Missouri Botanical Garden (1960), Hamburg Botanic Gardens (Germany, 1963), and the Exhibition Plant Houses at Edinburgh (Scotland, 1967). By 1980, floriculturists in the Netherlands became renown for concentrating on specific or related crops, relying on automated production, and selling crops by the auction market system

Advancements in the Greenhouse Industry

Significant technological advancements within the greenhouse industry have occurred recently. Upgraded growing structures, new coverings, and state-of-the-art equipment enable greenhouse owners to increase production, which translates into higher profits. Advancements in growing methods promote healthier, abundant crops. Developments in plant varieties contribute new colors, forms, and resistance to disease. Scientists engaged in biotechnology have produced dramatic results in improving plant production through genetic engineering. Thanks to biotechnological research, consumers can anticipate purchasing improved fruits and vegetables. See Table 1.1.

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Table 1.1 - Improvements in Fruits and Vegetables Through Biotechnology

| Fruit or Vegetable | Improvement |
|--------------------|---|
| Bananas | Resistant to fungus |
| Garlic | Increased capacity to lower cholesterol |
| Melons | Smaller, seedless; single-serving size |
| Peanuts | Improved balance of protein |
| Peas | Remain sweeter; higher crop yields |
| Strawberries | Increased levels of natural acids that fight cancer |
| Tomatoes | Higher levels of cancer-fighting antioxidants |

Economic Importance of the Greenhouse Industry

Because the greenhouse industry relies on a workforce and provides products that consumers use, its economic impact is felt locally, nationally, and globally. In 1999, Missouri floriculturists grossing \$10,000 or more contributed \$41.6 million to the state's economy. Floriculture growers grossing \$100,000 or more earned approximately \$34.3 million. Table 1.2 lists the specific crops included in this amount.

Table 1.2 - 1999 Missouri Floriculture Crops

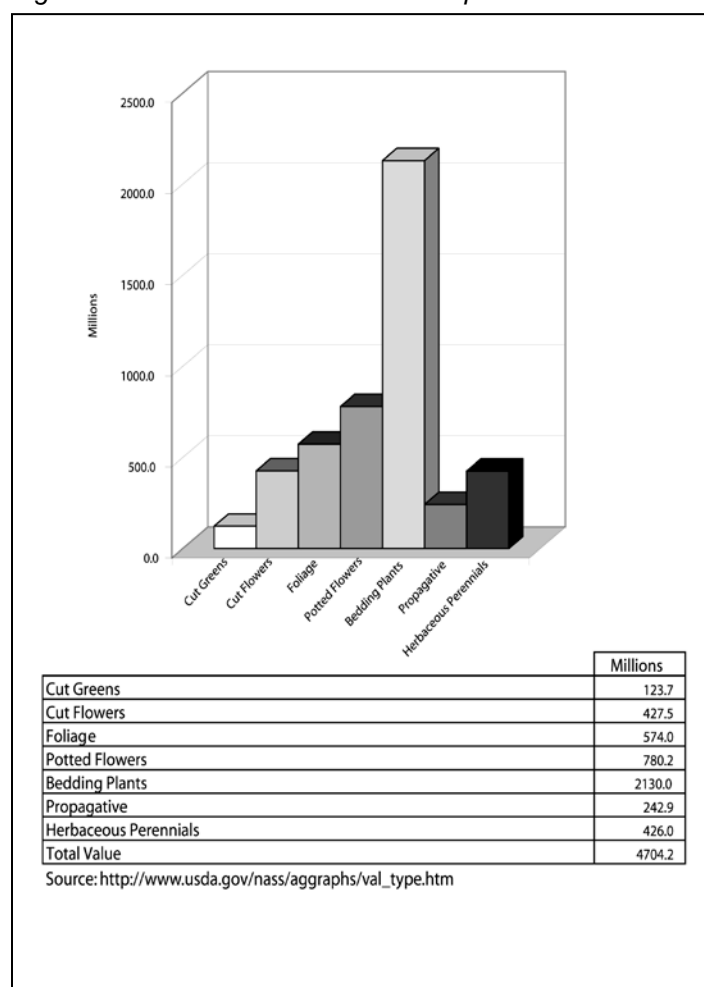
| Crop | Wholesale Value |
|---------------------------|---------------------|
| Cut Flowers | \$ 281,000 |
| Foliage Plants | 2,192,000 |
| Potted Flowering Plants | 11,711,000 |
| Bedding and Garden Plants | 20,085,000 |
| TOTAL | \$34,269,000 |

Compared to the rest of the nation in horticultural production (including sales from greenhouse operations, nurseries, landscaping outlets, and other dealers), Missouri ranks as follows:

- 26th - Floriculture
- 28th - Ornamental horticulture
- 28th - Pomology
- 31st - Commercial vegetables

In the United States, the 2000 wholesale value of floriculture producers grossing \$100,000 or more was nearly \$4.7 billion (including the value of propagative materials). See Figure 1.1.

Figure 1.1 - 2000 U.S. Floriculture Crops

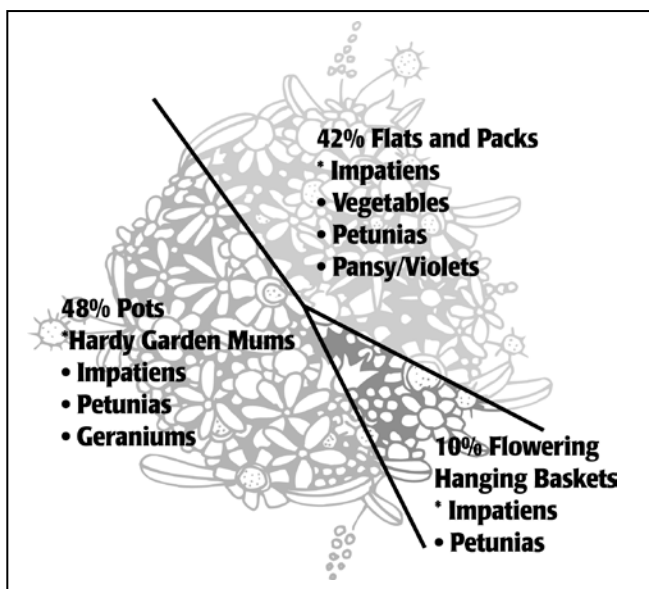


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Five states contributing the most to that amount are California (20%), Florida (18%), Michigan, Texas, and Ohio. In Texas, nursery and greenhouse industries are the second highest agricultural enterprise.

Half of the wholesale value of all reported crops comes from *bedding and garden plants* production. States contributing the most to this crop sector are California, Michigan, Texas, Ohio, and Florida. This segment is made up of potted bedding and garden plants, bedding and garden flats, and flowering hanging baskets. The percentages of these three crops are indicated in Figure 1.2.

Figure 1.2 - 2000 U.S. Bedding and Garden Plant Sector



Cultivation of *potted flowering plants* increased 3% from 1999. California was the predominant producer, contributing 18% of total sales. Top sellers were poinsettias, orchids, azaleas, and chrysanthemums.

Foliage plant production increased by 12% from 1999, with Florida capturing 69% of the total market. Within this market sector, 85% of total sales were for potted foliage plants.

However, in 1999, *cut flowers* suffered a 1% decrease in production and a 23% decline in the number of growers nationwide. Providing 67% of the total value for cut flowers, California dominated this market. Favorite flowers in this crop are roses, lilies, and gladioli.

In the *herbaceous perennials* group, 25% of the total production is hardy garden mums. *Propagative materials* are used to grow various types of plants; annual bedding and garden plants accounted for 44% of this market. There was a 2% decrease in production of *cut greens* from 1999. Florida contributed 81% to this market.

The floriculture market throughout the world provides income, employment, and marketing opportunities. The *Netherlands* exports tulip flowers and bulbs and is the international leader in floriculture enterprises. But bulbs exported from the Netherlands are not a direct threat to the U.S. economy because they are sold here and generate income.

In *Central and South America* (Mexico, Costa Rica, Colombia, and Brazil) the climate is favorable, which facilitates simple greenhouse construction. Several government-sponsored subsidies are available that help the greenhouse owner. There is plentiful access to a labor force. Cut flowers (e.g., roses and carnations), flower seeds, and foliage plants are cultivated in these countries.

Kenya has been involved in floriculture since the early 1970s. It produces mainly flowers (especially roses) and seeds for geraniums, petunias, and impatiens. Because of the climate, greenhouses require no supplementary heat. Labor is cheap and abundant. *Australia* and *New Zealand* produce orchids.

Summary

The greenhouse industry comprises four horticultural areas: floriculture, olericulture, ornamental horticulture, and pomology. Of these four areas, the floriculture market typically is the most prevalent, but any of the others also can contribute to the greenhouse industry. Spanning centuries, interest has developed in growing plants. The greenhouse industry has benefited from technological advancements over time and its future is bright. Thanks to improvements in building materials and equipment, greenhouse operations have become more sophisticated. And because of the contributions of plant scientists who are researching biotechnological enhancements in fruit and vegetables, the consumer can anticipate more nutritious and higher quality food in the future. The greenhouse industry sustains a significant portion of the economy of Missouri, the United States, and several countries around the world.

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Lesson 2: Career Opportunities in the Greenhouse Industry

This lesson first differentiates among the responsibilities of the grower (producer), wholesaler, and retailer; each offers potential employment. Lesson 2 then describes specific duties of various types of greenhouse workers, which may suggest career paths of interest. This lesson also explains the management structures of small and large greenhouse operations, which may help the job seeker. Also described are reasons for continuing education and for participating in agricultural educational opportunities, such as Supervised Agricultural Experience (SAE) activities.

Responsibilities of Grower, Retailer, and Wholesaler

Before selecting a career in the greenhouse industry, it is important to understand its basic elements: growers (producers), retailers, and wholesalers. The focus and tasks of each of these sectors vary and reflect different career opportunities. Growers cultivate one or more crops for sale to the wholesaler. Growers are skilled in cultivation, irrigation, and other cultural practices. In small operations, growers usually delegate marketing responsibilities to the wholesaler. Retailers sell greenhouse crops directly to the public and may also raise some of the plants. Because they deal with consumers, retailers have to be located in accessible marketing areas: grocery stores, florist shops, malls, etc. Wholesalers sell crops and related products directly to retailers and often sell plants from growers on consignment.

Career Opportunities

Successfully running a greenhouse depends upon effective coordination of specialized skills and consistent effort. The number of employees and

career opportunities varies depending upon the scope of the operation. If the greenhouse is fairly large, several types of jobs are required. Employees in large operations can investigate diverse careers, which are described here and are intended to be generic. Actual greenhouse operations may use different job titles, descriptions, and duties.

As an entry-level position, the assistant grower helps the grower perform tasks as assigned. This may involve working with the maintenance crew, shipping and delivering plants, or aiding with various cultural practices. The grower's responsibilities are multifaceted. Among his or her tasks are preparing the growing medium for bulbs, seeds, and cuttings; grafting plants; and transplanting seedlings and rooted cuttings. The grower also ensures that crops are irrigated as required. An important feature of the grower's job is to fertilize plants according to specific needs. Some growers are authorized to apply pesticides as well. Occasionally, he or she responds to customers' questions about caring for their plants.

The greenhouse service technician maintains all of the greenhouse's physical facilities and supervises the maintenance crew. Among the technician's duties are overseeing the mechanical integrity of the irrigation, electrical, and drainage systems. If any construction work is needed to repair or build greenhouse structures, the technician is in charge.

The greenhouse operation relies on the production specialist to stay up-to-date on technical developments that affect plant cultivation. Understanding plant science is critical to this career. The specialist schedules when to plant different crops and manages space allocation

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within the greenhouse, which contributes to crop yield.

Another position within the greenhouse operation is the marketing manager who oversees sales operations of the mature crops. Major responsibilities include customer relations, which involves contacting existing clients and seeking potential patrons, and postharvest crop assessment (grading and storing plants and flowers). The marketing manager also prepares each crop for shipment.

Ultimately, the success of a greenhouse operation depends on the vision and expertise of the owner/manager. This individual is responsible for organizing and prioritizing the flow of work, maintaining financial records, and developing the marketing plan. The owner selects the types and quantities of plants to grow and selects and orders growing supplies (fertilizer, seeds, etc.). It is this individual's responsibility to hire, supervise, and evaluate the staff. In addition, the owner may also respond to customers' questions.

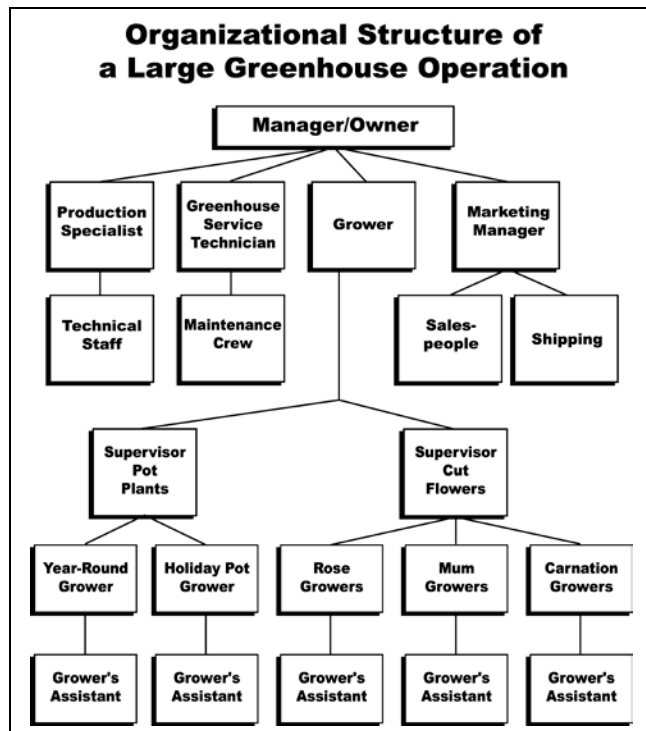
Organizational Structure of a Greenhouse Operation

Just like workers in other businesses, employees in the greenhouse industry are part of an overall organizational structure. Understanding the management structure and knowing one's position within the "chain of command" are conducive to making informed career decisions.

In small greenhouse operations, one owner/manager oversees all aspects of the business, although there may be several assistants. The owner specializes in all greenhouse operations. In large greenhouse operations, the owner may be the manager or a board of directors. Multiple greenhouse specialists contribute to different aspects of the operation. Each department (e.g., marketing, maintenance, plant production) has its own manager and group of employees. The

interrelationships among various facets of a large greenhouse operation are displayed in Figure 1.3.

Figure 1.3 - Organizational Structure of a Large Greenhouse Operation



Continuing Education

To progress within the greenhouse industry, whether in wholesale, retail, or a specific job as described above, additional training and education pave the way. There are several avenues for acquiring knowledge and expertise. By reading professional literature, such as greenhouse-related journals, publications from university Extensions, documents from county services, etc., the greenhouse employee can gain valuable insights. Becoming a member of a greenhouse-related organization and attending its meetings create a network of colleagues and a source of up-to-date information. It is also important to remain current on all technological advances in the greenhouse industry by interacting with coworkers, supervisors, and greenhouse specialists. If an interest develops in a highly specialized area,

taking advanced courses for a degree or enrichment fosters success.

Agricultural Education Opportunities

The greenhouse industry offers a variety of opportunities for agricultural education programs. Workplace readiness skills evolve as students develop successful work habits and job-related proficiency. Individuals accept responsibility and establish a solid work ethic, which means being prompt, communicating clearly and honestly, cooperating with coworkers and supervisor, and taking pride in one's work. By working in greenhouse operations, students can gain skills in record keeping, critical thinking, and decision making.

Working in the greenhouse industry also offers the opportunity for hands-on, real-world experience through on-the-job training. Management skills and job-seeking aptitude increase. It is also possible to earn a salary while learning. Especially meaningful is having guidance from individuals who are experienced in greenhouse operations.

Supervised Agricultural Experience (SAE) programs offer unique occasions for personal growth. In the entrepreneurship program, students run their own business. They plan and organize all aspects of an enterprise and are financially responsible for the operation. This means that they own all necessary materials needed to run the enterprise and keep financial records in order to assess how well their investment is performing. In entrepreneurial projects sponsored by GrowNative! (www.conservation.state.mo.us/programs/grownative), individuals or chapters grow plugs or produce seeds of native plants. Examples of entrepreneurial programs include growing bedding plants in school greenhouse for sale and raising poinsettias for sale.

In the placement program, students are placed in an agricultural business that interests them (e.g.,

wholesale greenhouse). This can be a paid position or an unpaid internship. The placement program occurs outside of regular school hours. Examples include working in a florist shop or for a nursery on weekends.

In a directed work experience students, instructors, and parents help plan an activity that meets the interests of the student. This is an unpaid position. An example is working in the school's greenhouse.

Agriscience research projects offer great opportunities for those interested in researching how things work. There are two types of programs available: experimental and analytical. An experimental research activity focuses on a specific, measurable objective and adheres to the scientific process. This activity involves several steps and requires a time commitment. It relates to a significant scientific or agricultural principle, issue, or question. An instructor supervises the students as they progress in this activity. Some examples of an experimental research program are listed below:

- Comparing the effect of different amounts of light on plant growth
- Comparing two types of fertilizer on plant development
- Analyzing the effectiveness of different display techniques on amount of plant sales in a nursery
- Demonstrating the effect of various levels of soil acidity on plant growth

An analytical activity does not use experimental methods. Rather, the focus is on collecting information from different sources and then evaluating the data. The goal is to create a finished product. Some examples of analytical activities include identifying suitable plants for a perennial garden for a senior center and creating a landscaping ad campaign directed toward new home owners.

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Students can earn awards and participate in interesting activities that relate to the greenhouse industry. Career Development Events sponsor contests in floriculture, nursery/landscape, and agricultural sales. Proficiency awards are granted in horticulture, turf and landscape management, floriculture, fruit and/or vegetable production, and specialty crops.

A final opportunity the greenhouse industry offers agricultural education is in school and community service. Building Our American Communities grants and partnerships with groups like chambers of commerce and garden clubs offer the chance to accomplish something valuable for others. Individuals may provide landscaping on school grounds or make plant arrangements for special school occasions, such as banquets and graduation. Other projects that would benefit the school or community are listed below:

- Create a hummingbird habitat
- Plant a garden with all-native Missouri plants
- Create a garden to attract songbirds and butterflies
- Create a garden that is made up of shade-loving plants
- Grow native plants for a highway project on behalf of the State of Missouri
- Grow plants as a wholesale product to retail operation

Summary

Career opportunities abound in the greenhouse industry. Positions are available in various sectors: at wholesale and retail levels and as a grower, greenhouse technician, production specialist, or marketing manager. Understanding the organizational structure of a greenhouse operation may influence one's career selection. By working hard and refining work skills, it is possible to advance to any level, including manager/owner. The greenhouse industry offers many opportunities for agricultural education.

SAE programs offer valuable hands-on experience.

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