

ORNAMENTAL PLANTS AND FLORICULTURE

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Summary

The production of ornamental plants and floriculture is by far the most diverse sector of horticulture. Relying on a long tradition of cultivar selection and improvement, highly specialized subsectors have emerged. Each of these has its own idiosyncrasy in propagation, cultivation and marketing. In this paper a general picture is given of the most important tendencies in the fields of: cut flowers, flower bulbs, potted plants, potted azalea, bedding plants and nursery stock.

The ornamental plant sector is highly innovative, and it is often a driving force in innovations in other areas of horticulture. Greenhouse technology and fertigation systems are usually highly advanced; cultivar innovation creates a tremendous diversity and beauty. Growers have adapted to advanced forms of water treatment and recirculation techniques; they have adopted modern acclimatization and heating technologies, and applied highly sustainable crop protection methods to reduce environmental hazards. Still, many future challenges are waiting to be tackled as the production of ornamental plants is globalized and society and consumer demands continuously change.

1. Introduction

Horticulture involves traditionally eight professional domains, which can be grouped into two broad sections, depending on the type of crop taken into consideration:

- Ornamentals crops: arboriculture, floriculture and landscape horticulture,
- Edibles crops: olericulture, pomology, viticulture, oenology and postharvest physiology.

Environmental horticulture, or *Green Industry*, involves the production, distribution and services associated with ornamental plants, landscape and garden supplies, and related equipment. Segments of the industry include wholesale nursery, maintenance firms, retail garden centers, home centers and mass merchandisers with lawn and garden departments, and marketing intermediaries such as brokers, horticultural distribution centers, and re-wholesalers (Hall, 2006).

This paper focuses only on the ornamental production, which is also grouped in two broad sections:

- Floriculture: including the production and marketing of floral crops like cut flowers, pot plants, bulbs, bedding plants and perennials.
- Nursery Stock: including the production and marketing of individual trees, shrubs, vines and other perennial hardy plants. The term Live Plants is often used for Nursery Stock and other plants, and is therefore not so easy to define in statistics.

2. Historical Background

Though the cultivation of plants has always been focused on food production, people have never neglected ornamental plants. Roses were cultivated about 5,000 years ago in China. Egyptians used the blue lotus (*Nymphaea caerulea*), the dwarf palm (*Chamaerops humilis*) and the papyrus (*Cyperus papyrus*) as motives in temples and buildings as early as 2800 BC. The date palm (*Phoenix dactylifera*) was a symbol of fertility, the papyrus of revival. The Egyptians are considered the founders of vegetal pharmacy.

Since the Antiquity temples and pavilions were surrounded by parks or green areas, and the famous Babylonian gardens were considered one of the seven world marvels. By 100 BC the Persians adopted the garden culture, insofar that the origin of the word paradise goes back to the Persian *pairidaeza*. Theophrastus, one of the pupils of Aristotle (370 – 285 BC), made the first systematic classification of all known plants and their medical use, and he is therefore considered the founder of botany. The botanical work and herbarium “*De Materia Medica*” by Dioscorides (first century AD) remained a standard work and a consulting reference well beyond the sixteenth century. Later on, wealthy Romans created gardens (hortus) around their house, where they grew flowers for in-house decoration.

Ancient Islamic civilizations paid much respect to nature as well. The *Koran* told to preserve nature, and gardens were considered a religious place and a paradise on earth. Trees and flowers got religious or symbolic appeal. The oriental plane – the mighty *chenar* – offered shade; fruit trees proved sustenance, and herbs and roots furnished medicines. Two Islamic botanists became world-famous: Ibn Bassal, who wrote a book about gardening around 1080 AD and Ibn al-Awwam who encouraged horticulturalists to work with a plan. The famous Saracens gardens in Andalusia have influenced garden building throughout the Middle Ages.

In Western Europe, the abbeys and monasteries started to copy the old Roman and Greek handwritings and transmitted the former botanical knowledge. Plants had a medical importance, flowers played a role in the religious life. Throughout the Christian era roses were scattered in churches to commemorate the gift of the Holy Spirit. The white lily (*Lilium candidatum*) was the symbol of the Virgin Mary.

In the Early Renaissance the re-awakened interest in nature resulted in a more scholarly approach to the classification of plants. Naturalistic flower paintings appeared in the margins of prayer books and in religious paintings. Botany became an independent science focusing on the study of plants themselves, and the discovery of the New World increased the interest on a great number of new plants.

In Europe, three famous botanists appeared from the second half of the sixteenth century onwards, e.g. Dodoens, Clusius and L'Obel. They published herbals or floras using woodcuts or paintings, often collected by their printer Plantin-Moretus in Antwerp, Belgium. Their contribution to contemporary botany lies in their direct observation of plants, their meticulous description and drawings, and in the assessment of native habitats. By the end of the 16th century the establishment of structural garden lay-outs with lively flowing forms, gushing decorations and theatrical effects became fashionable. Botanical gardens were established in Pisa (1544), Padua (1545), Florence (1555), Bologna (1568), Sienna (1588), and a few years later in other European countries (Jena, 1586; Leiden, 1587; Basel, 1589; Heidelberg, 1593; Montpellier, 1593).

3. Floriculture and Nursery Stock Industry

The increase of the world population over the last decades has involved a higher demand for horticultural crops, and this has been sustained by an increased adoption of free market policies and trade agreements, reducing trade barriers to plant shipments between countries. At the same time, the global expansion of horticultural products was stimulated by product improvement and an ever growing demand for luxury goods. In the past 15-20 years new production centers have been created in developing countries, enabling to increase local employment and to enhance national export revenues. These operations are usually organized by international mass marketers (Hall, 2006). Overall, worldwide demand for horticultural products is still growing, mainly following a dominant South-North direction, with the production centers located in warm-temperate areas and the main niche markets in industrialized countries. Independently from this international trade, regional supplies still remain important (Van Uffelen and de Groot, 2005). The International Association of Horticulture Producers (AIPH) delivers a yearbook '*International Statistics Flowers and Plants*' (AIPH/Union Fleurs, 2010), the statistics information of which is discussed in this paper. Due to the shortage of national production figures and poor reliability of statistical information in general, data must nevertheless be interpreted with caution. The worldwide production value of flowers and pot plants is estimated at 26,196 million euro, covering a total acreage of 702,383 ha and 223,457 holdings. Worldwide data about nursery stock and the production of bulbs are usually difficult to find, except for the EU. Tables 1, 2 and 3 give the best available information on land area, production value and holdings for flowers and pot plants, tree nursery and bulb production, respectively.

	Land area		Production value (*)		Number of holdings (*)	
	in ha	in %	million euro	%	No	%
Europe	48,705	6.9	10,843	41.4	37,319	16.7
Middle East	4,026	0.6	220	0.8	6,100	2.7
Africa	7,604	1.1	634	2.4	1,461	0.7
Asia / Pacific	523,829	74.6	7,608	29.0	156,764	70.2
North America	21,067	3.0	5,450	20.8	9,319	4.2
Central / South America	97,152	13.8	1,441	5.5	12,494	5.6
World	702,383	100	26,196	100	223,457	100

(*) without India and a few less important countries.

Table 1. Flowers and Pot Plants : Area of land, production values and number of holdings for the period 2000 – 2009 (Source : AIPH / Union Fleurs, 2010).

	Land area (ha)	Production (million euro)	Number of holdings
Europe	99,970	5,581	13,831
Turkey	1,968	-	-
China	424,925	2,981	-
Chinese Taipei	7,808	57	-
Japan	10,187	924	28,256
Australia	5,211	-	1,029
Thailand	1,559	-	3,354
Mexico	23,417	-	7,744
Canada	20,593	314	1,295
United States	182,753	7,793	-

Table 2. Tree Nursery : Area of land, production values and number of holdings for the period 2000 – 2009 (Source : AIPH / Union Fleurs, 2010).

	Land area (ha)	Production (million EUR)	Number of holdings
The Netherlands	23,561	535	1,790
Europe (total)	30,328	-	-
Turkey	54	-	-
China	4,680	75,9	-
Chinese Taipei	7	0.07	-
Japan	597	21.2	1,660
Korea (Rep.)	79	5.1	-
United States	2.472	-	-

Table 3. Bulbs : Area of land, production values and number of holdings for the period 2000 – 2009 (Source : AIPH / Union Fleurs, 2010)

3.1. Europe

With a share of 48,705 ha (approximately 6.9 % of the production acreage), some 37,319 holdings and 10,843 million euro production value (41.4 % of the world), the European Community (EU) is the most important production area for flowers and potted plants in the world. This is principally due to its high productivity. The total acreage of nursery stock in the EU is estimated at 99,970 ha, with a corresponding production value of 5,681 million euro. Bulbs, mainly produced in The Netherlands, represent a value of more than 600 million euro and are raised on a production acreage of 30,328 ha. The total production value of ornamental production in EU-25 – e.g. the European Union composed of 25 member states - is estimated at 17,145 million euro, the wholesale trade at 28,495 million euro and the retail trade at 38,495 million euro. The ornamental sector is responsible for 300,000 full time jobs in the production sector and 350,000 in the wholesale and retail trade sectors (Bunte and Van der Poel, 2010). Nursery stock activities are a very important sector in land-based industries, not only in terms of economic market value but also due to the potential risk to spread diseases between countries. Ornamental shrubs and trees account for more than 50 % of the sector value, with the EU domestic production as the main source for internal consumption (Tables 1 and 2). Intra-community trade represents more than 82 % of the total volume of delivered live plants and floriculture goods. Table 4 displays the ornament plant production in the different countries of EU-25, based on estimations of *Productschap Landbouw- The Netherlands*, Eurostat and estimations of Danish, German, Finnish and Austrian experts (Bunte and Van der Poel, 2010). The table shows that the production of floriculture and nursery stock is highly concentrated in The Netherlands, Italy, Germany and France. In terms of value the Netherlands are by far the largest producers, especially of cut-flowers, with a share of almost 31.5 % of the EU production. The Netherlands is also a very important producer of potted plants, bulbs, bedding and perennial plants and nursery stock. This country has moreover a key role as re-exporter of cut-flowers produced in developing countries. The most important auction for floriculture crops in the world is situated in Aalsmeer, The Netherlands.

	Production	Wholesale trade	Retail trade
Belgium	525	950	1,100
Germany	2,650	5,100	9,800
France	1,750	3,050	4,875
Greece	175	300	475
Ireland	125	200	325
Italy	3,075	4,000	6,000
Luxembourg	5	30	45
The Netherlands	5,225	7,750	2,300
Austria	200	500	800
Poland	165	415	525
Portugal	250	375	600
Spain	1,050	1,500	2,200
Czech Republic	125	250	300
Other EU-25 states	1,825	4,075	9,150
Total	17,145	28,495	38,495

Table 4. Ornamental plant production in the EU-25 for 2008 (in million euro).
(Source: Bunte and van der Poel, 2010).

In 2008 the EU-25 was a net importer of cut flowers and cut foliage and a net exporter of pot plants, conifers and hardy perennials and bulbs. The biggest exporters of live plants and products of floriculture to the EU are Kenya, Costa Rica, China, the US, Israel, Colombia and Ecuador. The EU-25 mainly exports live plants and floriculture goods to Russia, Switzerland, the USA and Norway (Ierugan, 2009; AIPH/ Union Fleurs, 2010).

Italy is the second producer of flowers and nursery stock within the EU, with a share of 17.9 %. Germany has a tradition in nursery stock and garden plants and is, together with France, the main contributor to the growth of the floriculture and nursery stock production in the EU. Denmark is famous for smaller potted plants. The UK, Belgium and Spain are smaller producers, but Belgium is the main producer of azaleas in het world.

After the EU enlargement from 15 to 27 member states, the horticultural production in Eastern Europe, including the former Soviet Union, has grown but is still limited (Table 4). Those countries are a growing market for the traditional exporting countries of Northern Europe.

The Netherlands, Belgium and Denmark have a favorable farm structure compared to Germany and the Southern European countries, due to a tendency towards farms increasing in size and decreasing in numbers for various reasons, such as high energy and labor costs, changing consumer demands, rapid technical developments, a stricter environmental legislation, and a growing competition for land and market shares.

Innovation, technical knowledge and commercial advantage are key words in modern industry and trade, including in horticultural products. The EU is now harmonizing the use and restriction of phyto-sanitary products in fungicides and insecticides, and this is seen as a potential reduction in the competitive advantage of countries which did not yet impose a regulation on active compounds in agrochemicals. Most farms are family driven, and the number of highly-trained employees is growing.

Research and development are well organized, especially in The Netherlands, Germany, Belgium and Denmark. Nowadays, governments urge industrial partners to take more financial responsibility in research and development. Individual consultants and groups start playing a key role in the technical and marketing support of firms.

3.2. North America

The land area dedicated to flowers and potted plants in USA covers about 20,184 ha or 2.8 % of the global horticultural acreage; it counts more than 7,189 holdings (2008). The USA is the second largest producer of flowers and pot plants in the world with 4,719 million euro or 18 % of the production value worldwide. California is the leading state and, together with Florida, Michigan, North Carolina and Texas, produces 66 % of the overall production value of flowers and potted plants. Bedding and garden plants are

the largest contributors to the production value and represent 49 % of the wholesale value of all floricultural crops. Cut flowers are mainly imported from Columbia and Ecuador. The United States is the main producer of nursery stock in the world with a production value of 7,793 million euro and 182,753 ha.

Canada is a relatively small producer with 731 million euro (2.8 % of the world production) value of flower and pot plants (AIPH/Union Fleurs, 2010).

Environmental horticulture is one of the fastest growing segments of the North American agricultural economy, often experiencing growth, innovation and expansion even during periods of economic recession. The green industry in the United States represents 148 billion euro in the economic impact and 2 million jobs, nationally (Hall, 2006). The impact of mass marketers on the nursery and floriculture industry is important, for example in promulgating an increase in the overall size of operations. The capital requirements, needed to afford the greenhouse infrastructure required to produce mass quantities of product in a confined marketing window, exceed those that this industry has historically managed.

Most firms have been able to generate enough capital on their own, but there are also examples of investment brokers entering the market to help finance some of different production operations related to enhancing production or marketing scale. There are also examples of large producers entering into a partnership with several smaller firms in order to produce the quantities required by large retail chains. On the other hand, the focus on mass marketers by large growers has created opportunities for smaller growers to develop niches serving independent retailers or to go into retailing themselves, selling directly to the consumer.

In recent years, the number of growers declines every year, or at least remains stable. A number of factors are speeding up this process, like: higher input costs (e.g. fuel), reduced margins, capitalization requirements and competitive rivalry among producers (Hall, 2006). In comparison with Europe, the floricultural production in the USA has an equally high technical level, but is more productive.

3.3. Central and South America

With 97,152 ha of cultivated land Central and South America accounts for almost 13.8 % of the world acreage under floricultural and live plant production; the corresponding production value is 1,441 million euro and the number of holdings accounts for 12,494. The leading countries for floriculture production in the region are: Colombia (1,104 million euro; 4.2 % of the world production value), Mexico (281 million euro, 1 % of world production value), and Ecuador (190 million euro or 0.7 %).

Colombia and Ecuador are very important cut-flower producers, and they export mainly to the United States. Guatemala and Costa Rica on the other hand export cuttings and young plants to the United States and Europe, especially The Netherlands.

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Biographical Sketches

Eddy Volckaert is the former director (until 2008) of the Ornamental Applied Plant Research Center (PCS) at Destelbergen-Gent, Belgium. He is an agronomic engineer from the University of Gent, with specialties in Horticulture and Agricultural Economy. He worked for five years in Tunisia, and became a horticultural consultant for the Ministry of Agriculture for eight years. In 1985 he was appointed director of PCS, and integrated all ornamental plant research in Flanders into a single coherent research station. From 2001 he combined the management of PCS with the vegetable and a potato research center at Kruishoutem (Belgium) and was advisory member of various national extension and research initiatives in the country.

Bruno Gobin is director of the Ornamental Applied Plant Research Centre (PCS) at Destelbergen, Belgium. He has a M.Sc. in biology (1993) and a Ph.D. in Entomology (1997) from the Catholic University of Leuven. He travelled in academia as a research fellow at Kagawa University (Japan), obtained a post-doc at the universities of Würzburg and Erlangen-Nürnberg (Germany), and worked as a research fellow at the Laboratory of Entomology, Leuven University, Belgium.

From 2004 onwards, his research shifted towards applied sciences as he became Head of the Zoology Department in the Royal Research station of Gorseme, with a focus on integrated pest management in fruit crops. He published numerous scientific and technical papers on entomology and crop protection. Presently, and in addition to PCS, he leads a Vegetable Research Centre and a Potato Research Centre at Kruishoutem (Belgium), and is advisory member of various national extension and research initiatives.