CO CONCEPT

Socio-economic impact of the peat and growing media industry on horticulture in the EU

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1 Structure of the study

Chapters 2 and 3 cover introductory notes and the objective and scope of the study.

Chapter 4 is the executive summary and highlights the most important findings.

Chapter 5 gives basic information on what peat, mires and peatlands are, the main differences between bogs and fens and their peat types and where peatlands can be found in the EU. Furthermore, this chapter covers in brief some historical aspects of uses of peatlands and informs the reader on why and for which purposes peatlands have been used for centuries. Chapter 5 also describes in brief horticultural peat production in the EU and contains information on the horticultural characteristics of peat, which is the reason for the application of peat as a growing medium constituent.

Chapter 6 explains what horticulture is and for which segments peat and growing media are essential production factors. Information on other applications of peatbased non-horticultural products is also given.

Chapter 7 reports on the data for peat and growing media production collected by Paul Waller Consulting via questionnaire. This data collection is unique, since it was obtained exclusively for this report.

Chapter 8 reports the horticultural data provided by CO CONCEPT. Basic data on the size and value of the European horticultural industry are mirrored, collected from a variety of sources. These facts and figures elucidate the importance of commercial horticulture in the EU.

Chapter 9 reflects on the socio-economic impact of the peat and growing media industry on horticulture in the EU.

In chapter 10 the main environmental issues which concern the industry and other stakeholders are considered. Based on a valuable survey conducted by the Commission II of the International Peat Society this part of the report also deals with the reasons why the use of other materials than peat in the EU is limited.

The conclusions drawn from all collated sources are reported in chapter 11.

2 Introduction

On 1st May 2004 the European Peat and Growing Media Association (EPAGMA) was founded by leading European peat and growing media companies. Today the Association has 16 members in 14 countries. Most of them are medium-sized, some are larger companies. As a fairly new organization EPAGMA represents about one third of the peat and growing media industry in the EU and its members account for an estimated 65-70% of all peat harvesting (horticulture, energy, etc.) within the EU. EPAGMA represents the peat and growing media industry at European level and acts as the interface of private member companies and their organizations and EU institutions, national governments, national peat and growing media associations and other stakeholders such as the International Peat Society (IPS). Among other tasks the Association monitors European and national policy developments and acts proactively on behalf of its members to ensure a competitive and viable peat and growing media sector linked to the European horticultural industry.

CO CONCEPT was asked to develop a study on the "Socio-Economic impact of the peat and growing media industry on horticulture in the EU". CO CONCEPT is a marketing consultancy enterprise located in Luxembourg and specialised in the agricultural and horticultural sector. One of its core competencies is market research, such as structure analysis of products, regions and sectors. Basis of this market research are empirical methods and evaluation of secondary statistic information.

Background and ongoing debate

In general the peat and growing media industry and environmental organizations disagree over the need and impact of peat extraction and the need, availability and quality of materials other than peat for horticultural use (Robertson, 1993; Hood, 1997; Schmilewski, 2006). Raeymaekers (2000) argues that, even though far fewer mires have been destroyed by peat extraction than by agriculture and forestry, this practice is the most damaging thing that can be done to a mire, in particular to bogs. Raeymaekers sees peat extraction as a serious threat, as it is usually the pristine bog ecosystems that are selected for the extraction of peat. The German peat industry - as the largest producer of growing media worldwide (BTH, 2002) - states

that permits for peat extraction in Germany can only be granted on degenerated bog areas and that such areas have been drained for a long time and are generally used as meadows and pastures or as arable land. Šnore (2004) argues that the role of peat - one of the richest natural resources of Latvia - could be much more significant in the country's economy.

As observed by Joosten and Clarke (2002) the production and processing of peat-based growing media has become a precondition for horticulture. From the viewpoint of the industry (EPAGMA communication) it is a challenge for the peat and growing media industry to continue to provide peat and horticultural growing media in an environmentally responsible manner while abiding by all relevant European and national legislation and with conscientious consideration of the guidance principles for the wise use of mires and peatlands written by Joosten and Clarke (2002).

In EU member states peat extraction must comply with stringent EU and non-harmonized national legislation. An array of regulations for conservation of natural resources and environmentally friendly production are in place. However, the implementation of EU legislation might differ per member state. Such regulations are

- Council Directive 85/337/EEC of 27th June 1985 "On the assessment of the effects of certain public and private projects on the environment" as amended by Council Directive 97/11/EC of 3rd March 1997 (same title)
- Directive92/43/EC of 21st May 1992 "On the conservation of natural habitats and of wild fauna and flora" (Habitats Directive)
- Directive 79/409/EEC of 2nd April 1979 "On the conservation of wild birds" (Birds Directive).

The industry must also comply with national legislation on labelling of peat and growing media if this exists. Such legislation differs from member state to member state, is not based on the same analytical methods, and does not allow for sufficient product transparency to the grower or end user (communication with Technical Committee 223 of the European Committee for Standardization). Non-harmonized legislation for growing media is considered a barrier to trade of growing media.

In order to be able to proactively react to this ongoing debate EPAGMA decided to develop two separate studies considering the position of the peat and growing media industry and that of the horticultural industry in the EU.

EPAGMA has requested CO CONCEPT to develop this study on the “Socio-economic impact of the peat and growing media industry on horticulture in the EU”. The core information is data on the peat and growing media industry which was collected by Paul Waller Consulting, United Kingdom, and provided to CO CONCEPT as a basis for this study and for interpretation. CO CONCEPT needed to collect further fundamental data on the horticultural industry in the EU to complete the study.

The second study is on ‘Legislation and permit policies regulating the use of horticultural and energy peat resources and peat-based products in the EU‘. It was developed by Fiona Gallagher, Barrister-at-Law, a legal expert with related industry experience in Ireland. It contains up-to-date information on the legal situation of peat extraction in main peat and growing media producing EU member states. The legal study is available as a separate report.

3 Objective and scope

It is within the environmental and horticultural scope given above that EPAGMA asked CO CONCEPT for a comprehensive, up-to-date and reliable picture of the peat and growing media industry in the European Union. Key facts and figures are needed to emphasize the importance and impact of the comparatively small peat and growing media industry on professional horticulture, which is a significant panEuropean business sector.

The aim of this project was to collect data on the peat and growing media industry in the EU and its individual member states in order to demonstrate the importance and socio-economic impact of peat production and the usage of peat and peat-based growing media. In order to underpin this main objective, CO CONCEPT and EPAGMA saw the need to include information on materials other than peat which are used as growing medium constituents. Valuable recent literature sources on aspects and possibilities of substituting peat were used. The information gathered is meant to be an information document for the peat and growing media industry itself, users of growing media, decision makers at the EU and national levels and stakeholders of any interest group.

No reliable data on the amount of peat extracted in peat producing countries in the EU was available at the outset of this study. In particular, no information was available on the amounts of peat and growing media usage in the various segments of horticulture in the EU. For this reason Paul Waller Consulting, experienced in this kind of research in the United Kingdom, were asked to develop a questionnaire covering these specific horticultural aspects of peat and growing media production and usage. The methodology of data collection is further explained in chapter 7.

The EU peat and growing media industry recognizes its responsibilities towards providing horticulture with high-quality products and is very conscious that it supplies products to an industry of much greater socio-economic importance than itself. CO CONCEPT was also commissioned to produce facts and figures for the main horticultural segments both inside and outside the EU. Subsequently, an overall

picture of the peat and growing media industry in the EU in relation to the horticultural industry in Europe had to be provided.

For better understanding of this study and the ongoing peat debate this report had to include some general but essential information on mires, peatlands, peat, peat production, and the different horticultural segments in which peat-based growing media are used.

Peat is produced in 8 EU member states and usage of peat and growing media spreads over all 27 member states.

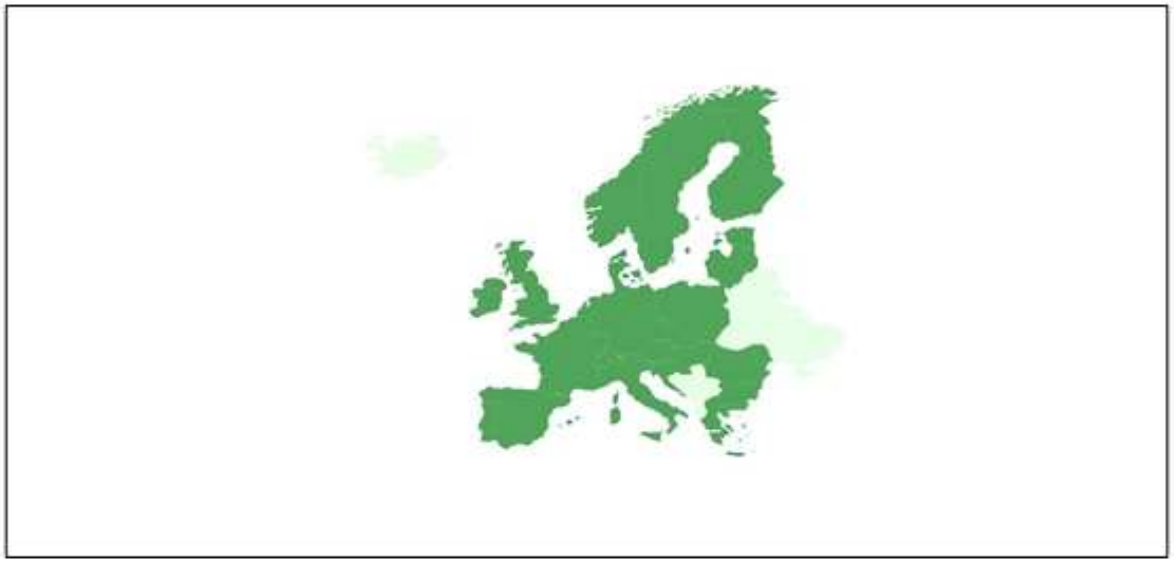


Figure 0: User countries of peat and growing medium= 27 EU Member States

4 Executive summary

This report reflects the outcome of a very detailed and thorough survey of the production of peat, its use as a growing medium constituent, and the importance of peat and peat-based media in the various segments of horticulture in the EU.

Key role played by peat in growing media

Peat used as a constituent in the production of growing media for commercial horticulture is a highly significant raw material, indispensable to vegetable and mushroom growing, floriculture and nursery management. Apart from good management and qualified staff, these segments of commercial horticulture are dependent on climate-controlled environments, integrated pest control, up-to-date fertigation systems and tailor-made growing media. Growing media are just as important working materials as water and fertilizers. In addition, growing media are designed for the many routine uses of horticulture in the hobby sector, from sowing bedding plants or herbs to planting balcony plants and trees.

Significance and size of peat industry

The peat and growing media industry in the EU has a strong significance on three levels: 1) extraction of the raw material, 2) production of growing media and 3) usage of growing media in horticulture.

Most of the horticultural peat producers in the EU are small- to medium-sized companies but with strong impact in the rural areas in which peat reserves are located. Growing media are produced in member states with and without indigenous peat resources.

The estimated number of full time employees involved in the production, processing, development, marketing and sales of peat and peat-based horticultural products in the eleven ‘producer countries’ and five ‘consumer countries’ surveyed is over 10,700.

Peat production and usage

In the past peat extraction companies helped governments to develop the then socalled 'wastelands' for settlements and agricultural use. Today, peat extraction is clearly regulated by EU and national legislation.

Five main EU Directives regulate peat extraction:

- Environmental Impact Assessment Directive
- Birds Directive
- Habitats Directive (Natura 2000)
- IPPC (Pollution) Directive
- Emissions Trading Directive (ETS)

In a legal study, also commissioned by EPAGMA, it was found that EU legislation is sometimes implemented differently in different EU member states, resulting in different extraction and after-use practices.

Peat resources and peat industry

Compared to other peatland usage (e.g. agriculture, forestry) the use of peatlands for peat extraction by industry is very small:

- Peatlands worldwide = 4,000,000 km²
- Peatland usage by industry worldwide = 2,000 km² = 0.05%

- Peatlands in EU = > 282,000 km²
- Peatland usage by industry in EU = 1,200 km² = 0.4%

The survey conducted in spring 2007 indicated that over 37 million m³ of growing media were produced in the EU countries surveyed; over 22 million m³ of this was for the professional market and about 15 million m³ for the hobby sector. Peat was by far the main growing medium constituent. Of this total material input about 29 million m³ was peat. Peat-free growing media occupy a largely subordinate position in growing media production in the EU.

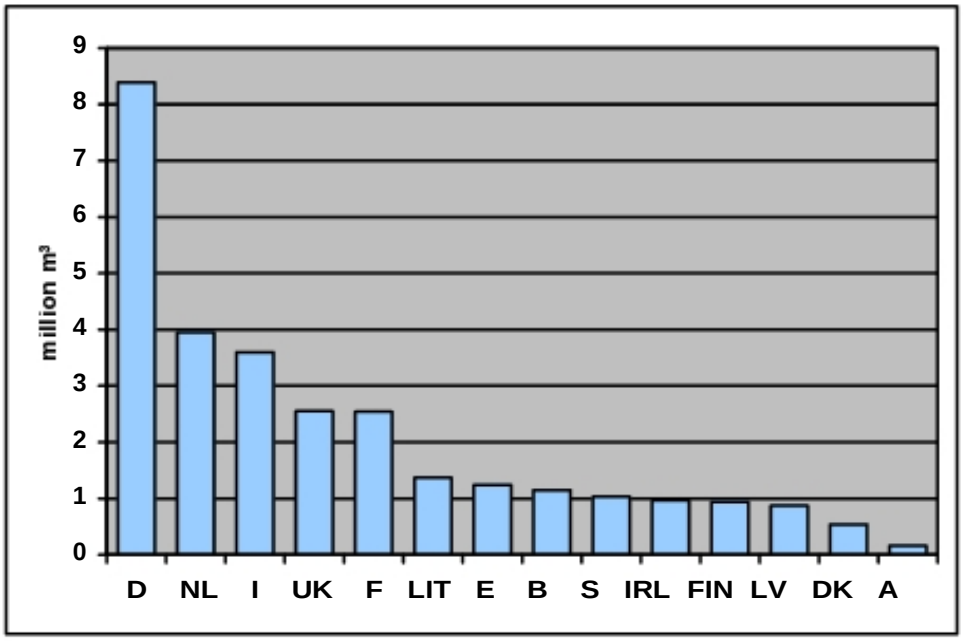


Figure 1: Peat usage in production of growing media in major producer and user countries (total = 29.3 million m³).

Imports and exports of peat

Those companies producing growing media will, in the medium and long term, import more peat than is already the case today. The reason for this is the constantly high demand for good quality constituents that are readily available. Today the main raw peat exporting countries are the Baltic states.

Either due to unsustainable peat extraction and use in the past or simply because extractable domestic peat resources do not exist, some of the main growing media producer countries are dependent on imports. In that regard the Netherlands provides evidence of the fact that highly technical and specialised horticulture cannot do without peat. The demand for growing media in countries with intensive commercial horticulture (including Belgium, Italy, France, Spain and others) that have little or no peat raw material deposits or commercial production of growing media of their own, must be primarily met by means of peat and/or growing media imports. The United Kingdom is today also importing more peat than in the past to satisfy market needs.

Of all growing media produced in EU member states 71% are sold on home markets, 25% are EU exports and 4% are non-EU exports.

Horticulture market segments

Horticulture focuses on products that are used for fresh consumption, namely fruit and vegetables, or for decorative purposes, namely trees, pot-plants and cut flowers. In general all products are perishable, high value products with a high potential of added value compared to main agricultural crops.

Regarding the world production of flowers and plants Europe holds the biggest market share (38%), although only approx. 9% of the global production area is located in this continent. Its high production value can be explained by a very intensive cultivation under glass. Almost 33% of the growing area in Europe is covered by greenhouses.

The per capita consumption of flowers and pot plants emphasises the demand for ornamental horticultural products in Europe. The average per capita consumption for Europe in 2004 amounted to €41.

The surveyed countries reported a total of almost 19 million m³ of peat used in the production of growing media for professional horticulture.

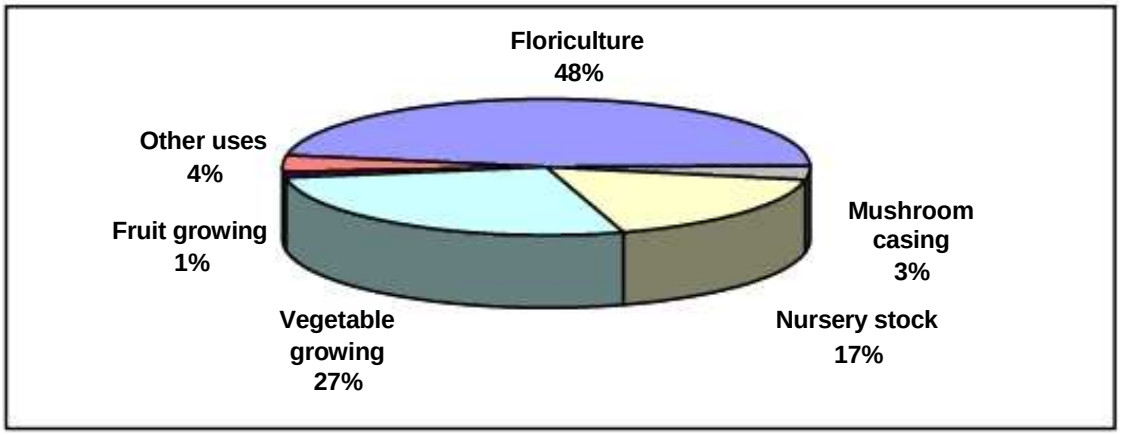


Figure 2: Percentages of the reported total of almost 19 million m³ of peat used for manufacturing growing media for different segments of professional horticulture in the EU.

The number of horticultural firms in the EU specializing in the cultivation of vegetables totals about 389,000. The vertical specialization of these firms is almost complete, as most firms do not propagate vegetables by themselves anymore. Propagation of many crops from seed is carried out by holdings that do nothing but propagate - in peat-based growing media.

Some 62,000 firms in the EU grow ornamental plants including pot plants and cut flowers on approximately 56,000 ha of land, partly as areas of protected cultivation. The production value of ornamental plants (excluding bulbs and tubers) amounts to over €11.8 billion resulting in a sales value of €23.1 billion. This segment of horticulture is increasing in terms of both size and value.

About 108,700 ha in the EU are needed for nursery stock production. The smaller part of this area would be used for container-grown trees, shrubs and other plant groups. The number of nursery holdings is said to be almost 18,000 in the EU 25. For cultivating in containers growing media are needed. Container production is still increasing. The value of nursery crops totals to about €4.7 billion.

About 11,000 employees are employed directly by the peat and growing media industry in the EU. In addition, peat extraction and the production of growing media also have an indirect impact on related secondary industries such as fertilizers or liming materials, but also on the transport and construction sectors.

Alternatives to peat

Although this report concludes that no other material combines as many favourable horticultural properties as peat does, the need to reduce, recycle and reuse materials in all aspects of daily life has provided an impetus to search for materials to replace peat. Much research has been conducted in past years throughout the EU to support the use of these replacement materials in growing media, and with some success. Basically, most other materials, like composted biodegradable waste, wood fibres or bark products, need to be diluted to improve their less favourable physical and/or chemical properties. The study shows that a comparatively small percentage of

materials other than peat are used for the production of growing media. This conclusion differs from country to country, however, depending on quality, availability and price of growing medium constituents.

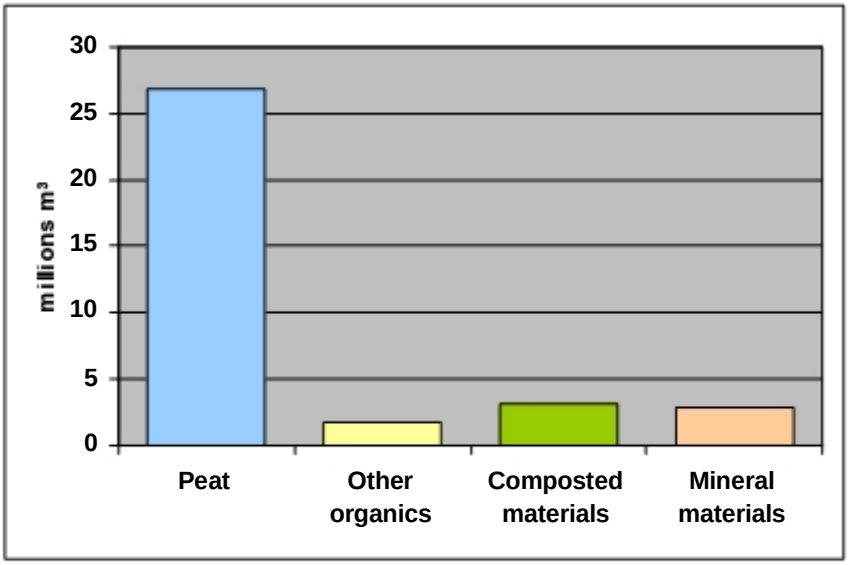


Figure 3: Quantity of different types of materials used for manufacturing growing media in major producer countries for the professional and hobby markets.

Conclusion

For the professional grower in the horticultural industry, the most important factor is that the growing medium functions well under the growing conditions. Although repeatedly promoted, other growing media constituents play, and will continue to play, a subordinate role as compared with peat. This is because peat has unique and extraordinary physical, chemical and biological characteristics which render it particularly suitable for use in horticulture.

The socio-economic significance of a raw material increases greatly at the stage of its use compared to extraction, mining or processing. Peat used as a constituent for the production of growing media for commercial horticulture is a highly significant raw material, indispensable to important segments of horticulture such as vegetable and mushroom growing, floriculture and nursery management. Given the data revealed in this report, it is clear that without peat modern horticulture in these segments would not be sustainable.

Peat

Depending on the scientific background of the author or an institute's area of work, a variety of definitions for peat can be found in literature, on websites or in national and international standards.

5.1 Definition and description

A short and reasonable definition is given by Joosten and Clarke (2002) who define **peat** as sedentarily accumulated material consisting of at least 30% (dry mass) of dead organic material. For better understanding it is important to add that peat accumulation occurs in **mires** only, that is peatlands where peat is currently being formed. **Peatlands** are areas with or without vegetation with a naturally formed peat layer of 30 cm or more on the surface. This definition for peatland is valid in most EU countries and other countries worldwide.

5.2 Peatlands in the EU

Peatlands occur worldwide on all continents from high cool-temperate latitudes with permafrost to the tropics. Environmental conditions i.e. temperature, hydrology and latitude are responsible for the different types of peatlands that have formed. Maltby and Proctor (1996) state that over 90% of all peatlands are in the temperate and cold belt in the Northern Hemisphere. The remaining area is concentrated in tropical and sub-tropical latitudes, much of it under forest. It is estimated that almost 95% of all peatlands are found in the territory of the former Soviet Republics (Commonwealth of Independent States = CIS) excluding the Baltic states and seven countries (table 1).

Table 1: Percentage of worldwide peatland area (Maltby and Proctor, 1996)

Country	Percentage of worldwide peatland area
CIS (former USSR)	38
Canada	28
USA	15
Indonesia	6
Finland	3
Sweden	2
China	1
Norway	1
Total	**< 95**

European peatlands, excluding the former USSR, amount to just 7% of the total area. Table 2 gives an overview of the land area covered by peatlands in European countries.

Table 2: Peatland areas (bogs and fens) in EU member states (combined areas) (Lappalainen and Zurek, 1996)

Country	Peatland area	
	km²	% of EU peatlands
Austria [2)]	220	0.08
Belgium [2)]	200	0.07
Bulgaria	30	0.01
Czech Republic and Slovakia	314	0.10
Denmark [1, 2)]	1420	0.50
Estonia [1, 2)]	10 091	3.60
Finland [1, 2)]	89 200	31.60
France [2)]	1 000	0.35
Germany [1, 2)]	14 205	5.03
Greece	101	0.04
Hungary	1 000	0.35
Ireland [1, 2)]	11 757	4.17
Italy [2)]	1 200	0.43
Latvia [1, 2)]	6 691	2.37
Lithuania [1, 2)]	7 942	2.81
Netherlands [2)]	2 790	0.99
Poland [1, 2)]	12 050	4.27
Portugal	200	0.07
Romania	70	0.02
Spain [2)]	385	0.14
Sweden [1, 2)]	103 790	36.78
United Kingdom [1, 2)]	17 549	6.22
Total	**282 205**	**100**

[1)] Member states with significant peat extraction (information provided by EPAGMA)
[2)] Member states with significant production of growing media (information provided by EPAGMA)

5.2.1 Bogs and fens

The fundamental subdivision of mires is into bogs and fens. Even at the broadest level of enquiry it appears that the terms bog and fen are adequate to subdivide all mires (Gore, 1983).

According to Kaule et al. (1990) **fens** (or minerotrophic mires) occur in association with high-nutrient (eutrophic) soils or evolve during the silting of nutrient-rich bodies of water. Influenced by groundwater and a plentiful supply of plant nutrients fens

have a rank vegetation. Sedge peat, reed peat and swamp forest peat are common fen peat types. Fen peats have less favourable properties from a horticultural point of view.

Bogs (or ombrotrophic mires) and the peats they contain are of great importance to the growing media and horticulture industries. Bogs have an autonomous water regime; their water table is supplied solely by atmospheric precipitation. Bogs occur only in landscapes having a positive water balance where total precipitation exceeds runoff and evaporation. Their vegetation and peat formation spreads over the surrounding landscape.

Raised bogs are the most commonly used peatland type for peat extraction. The reason for this lies in their formation and the characteristics of the peat they accumulate. Bogs are described as ombrotrophic, due to their very low nutrient status. Bog water has a low pH value and is low in oxygen which inhibits the decomposition of organic matter. As a result, only plant species well adapted to this habitat can grow in bogs. Peat moss, *Sphagnum* spp., dominates bog vegetation and accounts for most of the peat that accumulates in bogs. Other species common to bogs are cotton grass (*Eriophorum* spp.), pink bog rosemary (*Andromeda polifolia*), heath (*Erica tetralix*), heather (*Calluna vulgaris*) and others.

The degree of decomposition (or humification) of peat is decisive for its quality, extraction method and usage. The H1 to H10 Von Post humification scale (Von Post and Granlund, 1926) describes the degree of peat decomposition and is commonly used worldwide. In some countries it is also used for product specification. The higher the H-rating the more decomposed or humified the peat.

- Peat of the category H1 to H5 is *weakly* to *moderately* decomposed and often referred to as ‘white peat’.
- Peat with a moderate degree of decomposition (H4 to H6) is sometimes referred to as ‘brown peat'.
- Peat of the H6 to H10 category is *moderately* to *strongly* decomposed and often referred to as ‘black peat’.

5.3 Uses of Peatlands in the EU

First attempts to cultivate mires were undertaken by monasteries in the 12th century. From the Middle Ages onwards mires were systematically developed by building drainage systems and traffic routes. These are the reasons why countries like the Netherlands - formerly rich with peatlands - nowadays no longer have any considerable peatland areas or domestic peat resources.

Even today most peatlands in Europe, in particular fens, are used for agriculture. Maltby et al. (1992) report that for 200 years or more humankind has been altering bogs by drainage for agricultural use, development for settlements, afforestation, extraction of peat as a fuel resource and at a later stage, for the production of peat for horticulture.

5.3.1 Peat production in the EU

Depending on the peatland type, peatfield size, the degree of peat decomposition, climatic conditions, the amount of wood in the peat deposit and not least on economic considerations, peat is extracted in different ways.

In the EU to all intents and purposes peat extraction is no longer carried out by hand digging. Besides a number of less common methods, 'white' horticultural bog peat is extracted mainly by surface milling or sod cutting (Bragg, 1998); 'black' horticultural peat by freeze-treatment (Belka, 2000). Each method produces quite different types of peat structure. In the EU several hundred companies extract different types of peat for different purposes. Not all peatlands can be considered a resource for peat extraction. Not all bogs hold enough peat to be economic, and many are so remote that transport costs would be prohibitive.

5.3.1.1 Peat extraction methods

Surface milling (weakly to moderately decomposed peat)

Milling is the most widespread technique for the extraction of weakly to moderately (H1 to H5) decomposed bog peat. The top centimetres of the peatfield surface are scarified with agricultural implements such as tractor-mounted cultivators or harrows. When the peat is dry enough, its top layer is either vacuumed with harvesters into container wagons and then dumped into stockpiles on the field or it is ridged into field stockpiles ready for further screening, milling and blending (Richard, 1990). For economic reasons peat milling has replaced sod peat cutting in many peat extraction situations.

Figure 4: Harrowing of surface milled horticultural peat for better drying in Estonia

Sod cutting (weakly to moderately decomposed peat)

This method, using peat digging (or cutting) machines, is preferred when coarser peat particle sizes are needed, as the structure of the *Sphagnum* peat can be preserved more easily. Peat digging machines separate blocks varying in size from the cutting face of the bog and deposit them on the field surface (Richard, 1990). The moisture content of the sods is still very high (ca. 90% m/m) and requires drying by wind and sun for at least one year, depending on the local weather conditions. During this time the sods are mechanically restacked to improve the drying conditions. The peat sods are collected, transported to the peat works, hammer-milled and screened to the particle sizes required, then blended with other constituents and/or additives.

Production of frozen strongly decomposed peat (H6-H8)

After completion of surface milling or sod cutting of the weakly to moderately decomposed peat, the more decomposed underlying peat layers can be extracted. Strongly decomposed bog peat does not have the more favourable physical properties (good water and air capacity) of weakly decomposed peat, due to stronger decomposition of the *Sphagnum* mosses. To improve these characteristics for horticultural purposes, strongly decomposed peat is freeze-treated in the field. According to Belka (2000) strongly decomposed bog peat is excavated by using multi-bucket excavators or cable dredgers. The whole procedure is dependent on climatic conditions and can be split into four operating procedures, which are excavation, freezing, drying and collecting. In autumn the machines extract the peat from the deposit and side-place it on the field. The moisture content of the peat is still very high (ca. 90% m/m). During the winter the peat freezes thus improving its air and water capacities to suit horticultural demands. In spring/summer the freeze-treated peat dries and during the summer to early autumn period the peat is collected and further processed.

All peat production techniques are weather dependent. Occasionally, in years with prevailing wet summers, drying of peat is not optimal. In winters without sufficiently long periods of below zero temperatures, the freeze-treatment of strongly decomposed peat might be too short to obtain peat of the highest quality. Such circumstances can lead to a shortage of high quality horticultural peat, as was the

case in 1999 after a very wet summer in Europe the previous year (EPAGMA communication 2007).

5.3.2 European peat and growing media industry

There are approximately 4 million km² of peatlands worldwide, covering some 3% of the land surface (Maltby and Proctor, 1996). The peat industry worldwide uses about 0.05% (2,000 km²) of the global total area of peatlands for peat production. The figure for the percentage of peatland usage by the EU peat industry can be estimated as approx. 0.03% (1,200 km²) of the global total area of peatlands or 0.4% of the peatlands found in the EU (EPAGMA communication 2007). These figures include areas for extraction of peat for horticulture, energy and other purposes.

As defined by the European Commission for Standardization (CEN), a **growing medium** is a material, other than soil *in situ* (in its original place), in which plants are grown (CR 1999). Peat is the main constituent of growing media in the EU (Schmilewski, 1996, 2008; Reinikainen, 2001; Bohlin, 2002).

Millions of m³ of growing media are produced annually by hundreds of small- to medium-sized companies in the EU (see chapter 7). These growing media are used by tens of thousands of professional growers in the EU and, to a lesser extent, overseas. A huge amount of ready-to-use media are also consumed by end-users. A large number of growing media producing companies do not extract peat themselves; rather they buy/import it as a constituent. On the one hand, countries like the Netherlands, France, Italy and Spain hardly have any indigenous peat resources. On the other hand they are large users of growing media and horticultural heavyweights within the EU. A second group are peat extracting and also growing media manufacturing countries (e.g. Germany). A third category mainly extracts peat for further sale and/or export (e.g. the Baltic states).

Although peat is the main growing medium constituent a variety of other constituents are admixed to peat. Ancillary industries supply growing media producers with materials i.e. coir, bark, composted biodegradable waste, perlite, sand or any other growing medium constituent fit for purpose (see chapter 10.1). All growing media producers aim at low cost production of risk free and quality assured media. In the past the first container media in which plants were grown were composed of soil ex situ. Mixtures of different soils, soils with organic matter, soil mixtures with peat and, in the 1950's, pure peat-based growing media followed. This basic concept of industrially produced growing media is in principle also adopted by growers who still make their own mixes. Peat-based media have helped make many sectors of modern horticulture economically viable (Schmilewski, 2000).

Figure 5: Computer-controlled mixing line in Germany where different additives (e.g. fertilizer, liming material) are added to peat

5.4 Peat properties

Peat has many unique chemical, physical and biological properties. As a result of mire formation, origin, type, botanical composition, degree of decomposition, extraction and processing methods, peats can have varying characteristics (Puustjärvi, 1973; Puustjärvi and Robinson, 1975). Since bog peat is the main peat type used for the production of growing media, the focus of this subchapter is on this peat type and its horticultural properties.

5.4.1 Plant requirements, horticultural demands and growing media quality

Plants have certain requirements which the grower needs to meet with the help of growing techniques and cultivation measures tailored to them. The same is true for the amateur gardener. Growing media are part of this system of growing. Poor, inferior, good, suitable or outstanding are frequently used adjectives which go hand-in-glove with a subjective designation of the "quality". These attributes mean little, however, if the quality of a growing medium cannot be measured against certain product requirements. Quality is the condition and suitability of a growing medium with regard to its use (Schmilewski, 2005a). The requirement determines the quality needed. Modern horticulture with computer-controlled irrigation and fertilising programs, potting machines, pricking robots, climate-controlled greenhouses and just-in-time production requires dependable, quality-assured growing media. Growers rely on ready-made growing media which are either part of the manufacturer's standard range or special mixtures produced at the grower's request.

For the development of a formulation and the production of growing media, a large number of characteristics of the possible constituents must be taken into account in accordance with all the requirements (Table 3). In the event of these growing medium constituents having sub-optimum characteristics, the suitability of alternatives and additives for optimisation of the formulation must be checked.

Table 3: Characteristics and requirements of growing media and its constituents which need to be checked when producing and choosing a growing medium (Schmilewski, 1996; Reinikainen, 2001).

Physical characteristics
▪ Structure and structural stability ▪ Total pore space ▪ Water capacity ▪ Air capacity ▪ Bulk density ▪ Wettability
Chemical characteristics
ŷ pH ŷ Salinity (EC) and nutrient content ŷ Organic matter ŷ Buffering capacity ŷ Hazardous substances
Biological requirements
ŷ Content of weeds and viable plant propagules ŷ Pathogens and pests ŷ Microbial activity ŷ Suppressiveness of pathogens and pests
Environmental requirements
ŷ Local availability and minimization of transportation ŷ Renewable or recyclable constituents ŷ Easily recyclable or safely disposable after-use ŷ Minimal needs for application of pesticides
Economic requirements
ŷ Availability ŷ Continuity of desired characteristics ŷ Suitability for cultivation technique ŷ Requirements of the cultivated plant ŷ Price

5.4.2 The advantages of peat

Producers of growing media and growers run a high risk if constituents with inadequate characteristics are used. In particular, if excessively high percentages of these materials are used in the growing medium, there is a plant growth risk.

The parameters listed (Table 3) call for a growing medium constituent combining as many positive characteristics as possible. Thus *Sphagnum* peat has been the most important growing medium constituent for decades, as it provides the best overall basic prerequisites for the production of growing media. That is one reason why peat, after fertilising and liming, is often used as the only constituent in growing media. The most important positive characteristics of *Sphagnum* peat are summarised below (Schmilewski and Falkenberg; 2000 Schmilewski, 2005a):

- The cellular structure of very weakly to moderately decomposed *Sphagnum* peat (H1 to H5) with its large water/air retaining vacuoles guarantees a high water capacity with simultaneously high air capacity. Highly decomposed *Sphagnum* peat (H6 to H10) has a markedly lower air capacity. This is, however, considerably improved during the winter freezing process (see 5.3.1.1).
- The low pH and nutrient content permit the purposive increase of these characteristics to crop-specific values.
- Peat is, due to its formation, free of pathogens and pests and in the case of controlled production also free of weed seeds.
- The handling and processing of peat as well as fractionating and mixing are simple and possible without any health risk.
- Peat is, as regards price, highly competitive compared with other growing medium constituents. High value for money makes *Sphagnum* peat a cost-effective constituent.
- Peat is readily available in constant qualities in the long term.

In short, no other material combines as many favourable physical, chemical and biological properties as raised bog peat (Schmilewski,1996).

6 Uses of peat

The possible uses of peat are more versatile than commonly known. Peat, in particular bog peat, has particular characteristics allowing application in many areas (Grumpelt, 1983). Although not its most common use by volume, the use of peat in horticulture is well-known. Both professional horticulture and hobby gardening are sectors where peat is used on an everyday basis.

6.1 Horticulture

Horticulture can be divided into two groups: edible plants and aesthetic plants, more commonly known as ornamental plants. These two groups are sub-divided into different segments as shown in Fig. 6.

6.1.1 Professional horticulture

It is generally accepted by horticultural researchers and educators in horticultural science that horticultural crops include (Anonymus, 2005):

- Tree, bush and perennial vine fruits;
- Perennial bush and tree nuts;
- Vegetables (roots, tubers, shoots, stems, leaves, fruits and flowers of edible and mainly annual plants);
- Aromatic and medicinal foliage, seeds and roots (from annual and perennial plants);
- Cut flowers, potted ornamental plants, and bedding plants (involving both annual and perennial plants); and
- Trees, shrubs, turf and ornamental grasses propagated and produced in nurseries for use in landscaping or for establishing fruit orchards or other crop production units.

As in this study, cultivated mushrooms (edible fungi) are also most often classified as horticultural crops.

On the basis of the above information four major segments of crop production and one segment for landscaping can be identified:

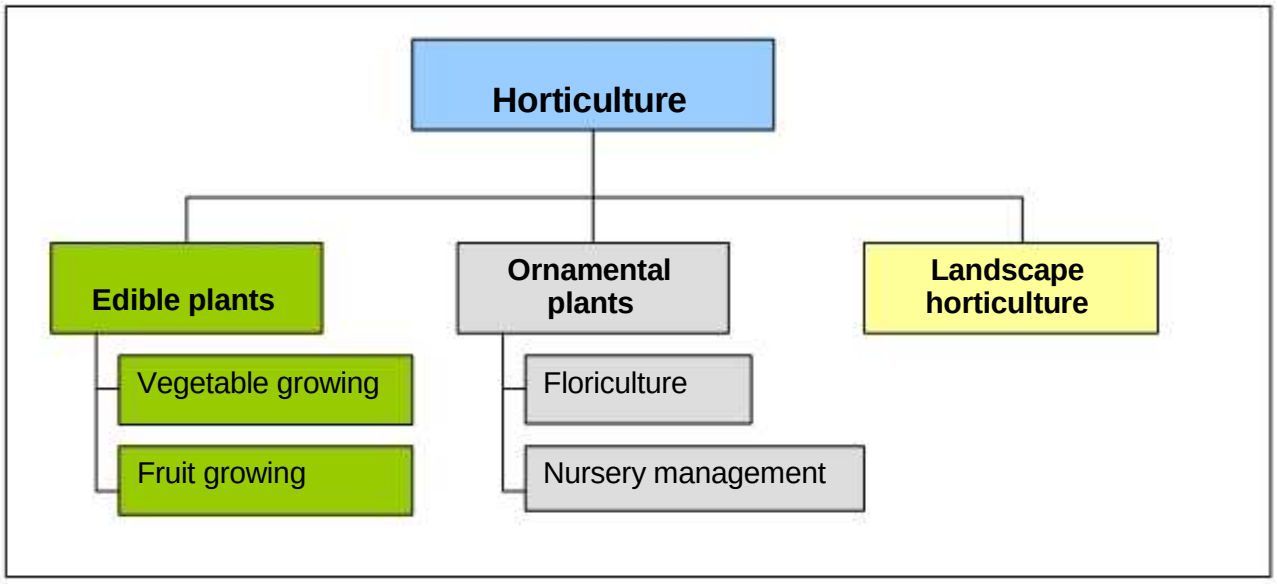


Figure 6: Groups and segments of horticulture

6.1.1.1 Floriculture

This horticultural segment is concerned with the science, commercial production, marketing, and sale of floral crops categorized as

- bedding plants (e.g. pansies, lobelia, marigold, geraniums, fuchsias, etc.)
- cut flowers (e.g. roses, chrysanthemum, lily, iris, gerbera, anthuria, etc.)
- potted flowering plants (e.g. orchids, poinsettias, azaleas, cyclamens, African violet, hydrangea, begonia, etc.)
- foliage plants (e.g. ivy, ferns and rubber trees, etc.) and
- flower arrangements

as well as non-commercial home gardening (hobby or amateur gardening).

Figure 7: Anthurium grown for cut flowers and as a pot plant in a fibrous peat mix in Poland.

Bedding plants, potted flowering plants and foliage plants are propagated in different ways. Annuals, biennial, and many perennial plants are propagated by seed. Vegetative propagation is carried out e.g. by division, leaf cuttings, leaf-bud cuttings or micro-propagation. Except for micro-propagated plants grown on artificial agar-media, plants propagated by seed, dividings and cuttings need growing media to thrive in. All propagated young plants of this category, including micro-propagated plants, are transplanted into other growing media after their juvenile stage and cultivated until they are sold. Young plants are quite sensitive to media with high nutrient levels, which generally limits any amount of composts used, for example.

Some cut flowers, i.e. gerberas and anthuria, are also cultivated in growing media and not in soil.

Figure 8: Greenhouse-grown cut flowers (gerbera) in containers in Germany.

6.1.1.2 Nursery management (nursery stock)

Nursery management is the propagation and production of shrubs, trees, ground covering plants, vines, herbaceous perennials, and grasses for usage in gardens, parks, and other exterior landscapes. The trend to grow nursery stock in containers remains unaffected in the EU.

Figure 9: Container-grown fruit trees in peat-based growing medium in the Netherlands

Propagation and growing on of nursery stock in pots and containers is dependent on growing media. Stem cuttings of hardwood (e.g. rose), semi-hardwood (e.g. camelia, holly) and softwood (e.g. lilac, forsythia, weigelia) or young plants propagated by root grafting (e.g. apple, pear) and crown grafting (e.g. many evergreens) require growing media fit for purpose. In the EU large amounts of media are needed for growing on plants, as quite large plant containers are used. High structure stability and good physical properties are the main characteristics required of a container medium. Heavy precipitation could otherwise cause water-logging. Coarse sod peat, sometimes blended with other materials, is often the basic medium.

6.1.1.3 Vegetable growing (Olericulture)

Olericulture is the study of vegetable growing but also the production of plants for use of the edible parts. It deals with the cultivation, storage, processing, and marketing of vegetables. Vegetables are non-woody (herbaceous) plants for food. Cultivated mushrooms (edible fungi) are also classified as such. Many vegetable crops are

propagated in growing media and then transplanted to the greenhouse or open field for further cultivation. Some crops are cultivated from seed or seedling solely in growing media until harvest.

Figure 10: Field cultivation of lettuce after greenhouse propagation in peat blocking media.

Vegetable crops cultivated in growing media as young plants can be classified in various categories:

- Salad crops (e.g. lettuce, celery)
- Cole crops (e.g. cabbage and cauliflower)
- Potherbs and greens (e.g. spinach and collard) ▪

Bulb crops (e.g. onions, leak)

- Cucurbits (e.g. melons, squash, cucumber)
- Solanaceous crops (e.g. tomatoes, peppers)

Figure 11: Organic-grown basil in peat-based medium with 15% composted biowaste on ebb-flood benches in United Kingdom

In this horticultural segment the development of new growing systems has exploded in recent years. It was strongly decomposed frozen raised bog peat that made the development and use of blocking machines feasible and revolutionized vegetable production, but also made many growers dependent on peat blocking media.

Multi-cell tray cultivation of seedlings often requires no more than 10 cm^3, 5 cm^3 or even less of growing medium per module to cultivate a young cabbage, lettuce or herb. Thus one m^3 of growing medium enables production of 300,000 or more plants. Important aspects are uniformity and best physical properties of the medium.

Figure 12: Robots transplanting young pansies into larger modules in Germany.

6.1.1.4 Mushroom growing

Edible mushrooms are cultivated on substrate mixtures composed of e.g. straw, horse manure, chicken manure, gypsum, sometimes in combination with low amounts of peat and a variety of possible additives. By far the most important edible fungus in the EU is the commercial (white) mushroom (*Agaricus bisporus*). An essential part of the technique of mushroom growing is the use of casing soil (Menzel, 1989). The mushroom casing soil layer, which is a few cm thick and covers the basic straw substrate, must have certain features that promote the development of mycelium and fruiting bodies (Lelley, 1991):

- pH 7-8
- high water and air capacity
- free from pathogens, pests and competing organisms

Figure 13: Growing commercial (white) mushroom with peat-based casing soil.

Limed strongly decomposed frozen bog peat with a slightly alkaline pH forms a highly successful casing soil which is applied by most mushroom growers in the EU. The crumbly structure of the peat prevents overwatering and makes mechanical watering easy. Other materials such as sand and loam are sometimes added to the peat. Spent mushroom casing soil is recycled as a soil improver or planting mix.

6.1.1.5 Fruit growing (Pomology)

Pomology is the science and techniques associated with the production and marketing of fruit. Only a relatively small amount of growing media is used in this segment. Besides being cultivated in the open field strawberries are sometimes grown under controlled conditions in greenhouses in peat-based or other growing media. Growing media are also used to grow ornamental fruit trees in containers by the end user.

6.1.1.6 Landscape horticulture

The field of landscape horticulture is mainly landscaping and maintaining gardens, private and public parks, leisure centres and sports grounds and creating slow traffic areas. 74,000 medium sized landscape companies in the EU provide about 350,000 jobs for this increasing trend.

In landscape horticulture growing media are used as soil improvement and to plant shrubs, trees, bedding plants, etc. in the ground. Many special planting media have been developed for this purpose.

In its report CR 13456 (1999) the European Commission for Standardisation (CEN) defines **soil improvers** as materials added to soil in situ primarily to maintain or improve its physical properties, and which may improve its chemical and/or biological properties or action.

A variety of organic and organic-mineral materials can be applied to soil to improve its condition. Kolenbrander (1974) discovered that at the end of an eight year long soil improvement trial in which various organic soil improvers had been applied (peat, green manure, forest litter, leaf mould, cow manure, saw dust, coniferous needles), peat proved to be the most stable of all. Kolenbrander reports that 51% of the applied organic matter could be recovered in the peat treatment compared to only 3-27 % for all other materials added to the soil.

When worked into light soils peat improves their water-holding ability. The texture of heavy soils is loosened, making them crumbly and easier to work. Field cultivation of trees and shrubs requires a high soil humus content to obtain rapid plant development. Soil lost by digging out marketable field nursery stock with root balls can be compensated for by soil improvement with peat. Soils in which calcifuge plant species such as *Rhododendron*, *Erica* and *Calluna* are cultivated grow best in soils characterized as being acid, rich in organic matter with a good structure and water-holding ability, but well drainable and low in nutrient content. Growers as well as

amateur gardeners appreciate the quality of *Sphagnum* peat in this respect, as peat meets these requirements best (Schmilewski and Härig, 1993).

Figure 14: Container-grown heather and heath on a nursery in Belgium for landscaping purposes.

Despite its soil improving and long-lasting characteristics in soil, peat is gradually being replaced for this application by recycled materials such as composted biodegradable waste, composted bark and mulch materials such as bark.

6.1.2 Hobby market

6.1.2.1 Growing media

Home gardeners depend on good quality media for sowing, transplanting and potting purposes. In principle, their requirements concerning the properties of growing media are as exacting as those of professional growers, even though home gardeners do not run the risk of loss of earnings by choosing the wrong growing medium or using it in the wrong way.

Also for the hobby market ready-to-use and fit for purpose growing media such as potting soils, media for sowing, pricking and transplanting, media for planting shrubs and trees, special growing media for bedding and balcony plants, orchid media, cacti mixes and many other media have been formulated. For most of these applications peat is the basic constituent. Materials other than peat are more likely to be used in higher proportions than for the professional market.

6.1.2.2 Soil improvement

All the observations made in chapter 6.1.1.6 are also valid for the use of peat and other soil improvers in amateur gardening. The main uses of peat are for planting calcifuge plant species i.e. rhododendron, heather and heath, but also for general soil improvement such as for lawn soil preparation or for planting of shrubs and trees. In this area peat can be replaced by other materials quite easily.

6.2 Non-horticultural applications of peat

Due to its unique properties bog peat is valued for a number of uses other than horticulture. Peat has antiseptic, absorbent and deodorizing properties (McLellan and Rock, 1986) and is also applied as a natural remedy (Ziechmann, 1987). Peat also has a long history of being used as a fuel and energy source.

6.2.1 Peat as an energy source

In countries with peat resources, the use of peat for burning and heating has a long tradition (Maltby et al, 1992; Šnore, 2004; Fitzgerald, 2006). Today peat production for fuel and power generation is carried out in the EU member states Estonia, Finland, Ireland, Latvia, Lithuania, Sweden and on a small scale even in the United Kingdom (table 7). In these countries peat is considered an alternative local energy and fuel source. In Ireland and Finland about 5-7% of primary energy is produced with peat. In Estonia the percentage stands at 1.9% and in Sweden at 0.7%. In Latvia

and Lithuania peat provides an even smaller proportion of the total although its use is currently increasing. Energy peat goes into power plants, condensing power generation, district and residential heating. Almost 2 million people in the above countries are provided with heating from peat (Paappanen and Leinonen, 2006).

6.2.2 Peat in medicine

Eichelsdörfer (1990) says that traditionally the main emphasis in peat balneology has been placed on the physical effects of the treatment, whereas other experts stress its biochemical effects. Peat therapy with medicinal peat as a remedy is being used traditionally in Austria, Czech Republic, Germany, Hungary, Poland, Slovak Republic, and more recently in Finland. Slurry-like peat baths as well as peat-based pastes, ointments and charcoal tablets are offered for various fields of medical treatment.

6.2.3 Peat-based activated carbon

Activated carbon is a microporous carbon, which is made of e.g. strongly decomposed bog peat, wood, lignite, bituminous coal and coconut shell (Anonymus, 1985). Activated peat is an extremely valuable type of activated carbon. During activation, pores of molecular dimensions are formed, having large internal surfaces of $\geq$ 1600 m²/g (NORIT, 2007). Peat-based activated carbon has a strong adsorption capacity exerting a force of attraction on the molecules of the surrounding liquids or gases. Activated carbons are used in a wide variety of applications, i.e. wastewater treatment, food manufacture, purification of both alcoholic and non-alcoholic drinks, pharmaceutical purification of materials when processing antibiotics, vitamins, etc., as a purifying agent in the chemical and electroplating industries, particularly to comply with environmental protection requirements, as a purifier in gas masks, etc.

6.2.4 Animal bedding

Richard (1990) reports that even today weakly decomposed bog peat is still being used for **animal bedding**. It has a high absorption capacity for both liquids and odours and is thus suitable for use in livestock housing and in the treatment of farmyard manure. This usage of peat is still fairly common in Scandinavia, but the overall amount used in the EU is comparatively small.

6.2.5 Other non-horticultural uses of peat

Weakly decomposed peat, having a high specific surface area, is sometimes used as filter media and adsorbents, often in combination with compost, brushwood, coir fibres or ericacious plant materials. Dried fibrous weakly decomposed bog peats are preferred to mineral adsorbents because of their hydrophobic nature and easy disposal (Viraragharan and Mathavan, 1989). Such **biofilters** are used e.g. in biological waste air cleaning in sewage plants, slaughterhouses, blood meal factories, poultry excrement drying plants, sugar beet drying and tobacco processing.

Peat can be used to clean up **oil spillages**. In Finland peat is a standard working material for oil-combating stations. McLellan and Rock (1986) report that the Netherlands imported approx. 10.000 m^3 of weakly decomposed bog peat for cleaning up oil spillages. Oil-soaked peat can be disposed of easily by burning.

After a phase of intense research and development several companies in Sweden and Germany offer **peat for insulation** in house construction, where it is used for floor, roof and wall insulation.

The fibres of cotton grass, often part of the extracted peat, can be used in combination with wool for manufacturing **textiles** such as blankets, sweaters and jackets. Specialized small companies in Scandinavia produce such commodities.

An economically important use of peat in Scotland is for the production of **Scotch whisky** which gets its special flavour during the initial malting process from peat.

7 Quantitative data on current peat production and consumption in the key EU countries

With the support of Paul Waller Consulting, CO CONCEPT was engaged in this project to collect key facts and figures of the peat and growing media industry in the EU and the individual member countries. This exploratory study aims at providing EPAGMA with a general picture of the peat and growing media industry in the EU and a general economic assessment, showing the importance of the industry itself and, in particular, its importance as an ancillary industry to horticulture. At the outset of this study there was no extensive data available.

7.1 Methodology and data collection

Paul Waller Consulting developed a questionnaire covering specific horticultural aspects of peat and growing media production and usage in the EU. Waller drafted a comprehensive questionnaire and finalized it with experts within EPAGMA. In principle, data for the year 2005 were requested. The questionnaire was distributed to country data coordinators as suggested by EPAGMA, being experts in their own countries. In some cases the country coordinators were representatives of national peat and/or growing media associations, in other cases individual experts with a network of expert sources. The questionnaire was distributed in December 2006. The country coordinators were responsible for collecting data from peat and growing media producing companies in their countries.

7.2 The questionnaire

A distinction was made between so-called ‘Producer Countries’ and ‘Consumer Countries’. Producer countries are considered to be main peat extracting and processing countries in the EU; these might have considerable or only small usage of the end product (e.g. growing media). Consumer countries are those which have little or no peat extraction but maintain a large or at least a noteworthy growing media industry.

The following official country codes listed by country in alphabetical order are used in some of the tables and figures in this report.

Producer countries

DK	Denmark
EST	Estonia
FIN	Finland
F	France
D	Germany
IRL	Ireland
LV	Latvia
LT	Lithuania
PL	Poland
S	Sweden
UK	United Kingdom

Consumer countries

A	Austria
B	Belgium
I	Italy
NL	Netherlands
E	Spain

7.2.1 Notes on completing the questionnaire

Table A (Appendix A) shows the questionnaire which was sent out to the country coordinators. For better comprehension and to avoid misunderstandings and misinterpretation, which obviously would have had an impact on the completion of the form sheet by individual country experts, Paul Waller Consulting, together with EPAGMA experts, defined specific terms related to peat and growing media production as well as to the different horticultural segments. The detailed set of notes, definitions and specific terms that was produced accompanied the questionnaire. The individual country coordinators and data collators were asked to

read these notes and definitions very carefully before completing the questionnaire. In general the definitions contain the basic information given in the more detailed explanatory definitions in chapter 6 of this report.

7.3 Data collection results

Although the questionnaire was developed to be as comprehensive but nonetheless as simple as possible, it took considerable efforts to collect the data used in this report. All country coordinators made an effort to provide as complete and precise data as possible. Due to lack of national statistics or because estimations of certain amounts of peat-based products had to be made, the summarized data can only reflect the data actually obtained. This study reflects the best available data on peat production and peat and growing media usage in the EU.

7.3.1 Peat production in the EU (2001-2005)

Peat production is defined as the actual amount of peat that was harvested (produced) and put into stockpiles at production sites in the country in the given period and quoted in m^3 (according to EN 12580). Table 4 shows the total amount of peat harvested in the years 2001 to 2005 and the 5-year average for producer and consumer countries. These production figures include peat for all areas of use including commercial horticulture and the hobby market, soil improvers (commercial and hobby), peat for energy use and any uses other than horticulture or energy.
Peat production is weather dependent. Therefore, the production can vary greatly from one year to the next.

Table 4: Peat production (harvest) data in 000's cubic metres

Country	2001	2002	2003	2004	2005	5-year Average
'Producer Countries'						
Denmark	287	336	314	345	323	321
Estonia	3074	6681	3838	2747	3877	4043
Finland	23500	30282	25333	13299	25988	23680
France	n/a	n/a	n/a	n/a	n/a	273
Germany	8336	7519	6780	8700	8400	7947
Ireland	14160	9902	17280	14226	13394	13792
Latvia	2340	4235	3025	2980	3955	3307
Lithuania	1284	2081	1743	1803	1897	1762
Poland	1800	1900	1800	2000	2100	1920
Sweden	3800	4650	4100	3000	3300	3770
United Kingdom	n/a	n/a	n/a	n/a	n/a	1600
'Consumer Countries'						
Austria	50	48	45	40	40	45
Belgium	0	0	0	0	0	0
Italy	0	0	0	0	0	0
Netherlands	n/a	n/a	n/a	n/a	n/a	50
Spain	178	202	226	251	275	226
Total						**62737**

The largest overall peat producing countries in the EU are Finland, Ireland and Germany, harvesting 74% of the total production (Figure 15). Most of the peat produced in Finland and Ireland is used for energy purposes. Sweden also produces a considerable amount of fuel peat.

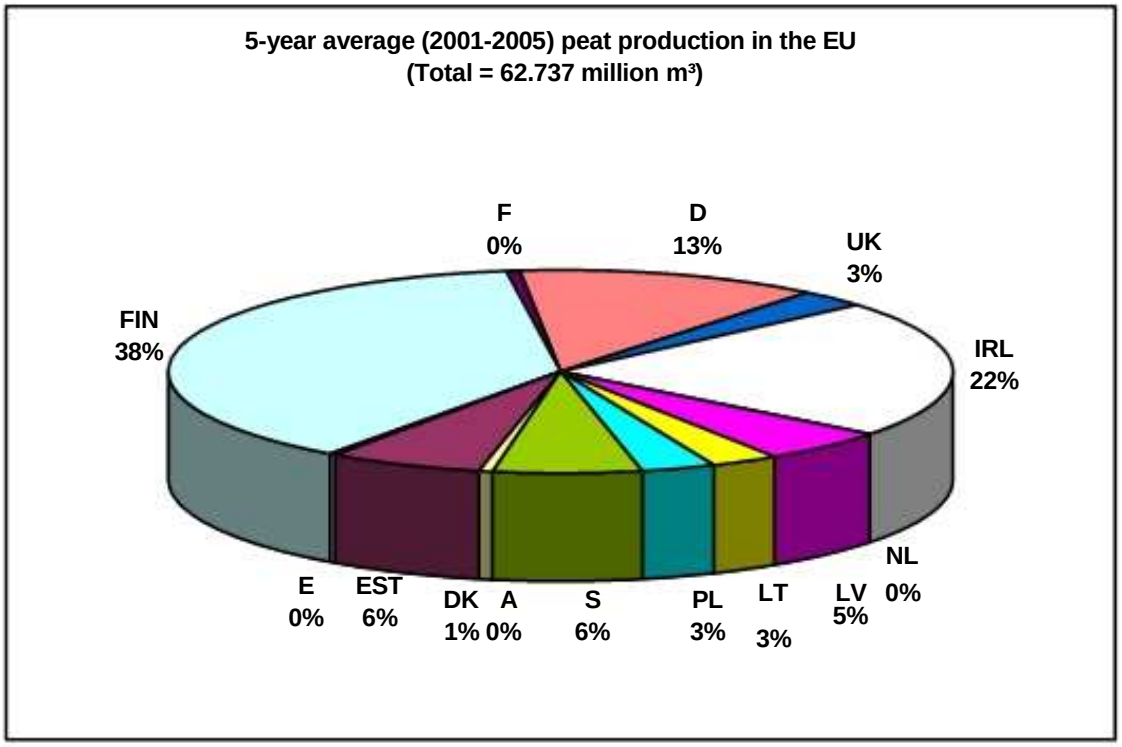


Figure 15: 5-year average (2001-2005) peat production/harvest in the EU. The total average annual amount of almost 63 million m³ is the volume of peat that was put into stockpiles at production sites in the country and includes peat for horticulture, energy and other usages.

7.3.2 Raw peat consumption based on domestic and imported sources

In the context of this survey report peat consumption is defined as the total amount of domestic and imported raw peat that was used in the manufacture of peat and products containing peat for all uses (at home and abroad) in a given period and quoted in m³ (EN 12580). The relevant data are given in Table 5.

Table 5: Raw Peat Consumption in 000's cubic metres

Country	Year	Domestic sources	Imported sources	Total
'Producer Countries'				
Denmark	2005	323	219	542
Estonia	2005	1745	n/a	1745
Finland	2005	23944	0	23944
France	2005	273	2299	2572
Germany	2004-5	8550	1975	10525
Ireland	2005-6	11025	0	11025
Latvia	2005	870	0	870
Lithuania	2005	1632	0	1632
Poland	2005	1920	200	2120
Sweden	2005	3270	0	3270
United Kingdom	2005	1320	1399	2719
'Consumer Countries'				
Austria	2005	40	135	175
Belgium	2004	0	1333	1333
Italy	2005	0	3900	3900
Netherlands	2005	50	4183	4233
Spain	2005	275	967	1242
Total				**71867**

Table 6 summarizes the amounts of imported finished products for domestic consumption meaning any peat-containing product that is imported for sale or use in the country and quoted in cubic metres (EN 12580). Although not differentiated, the figures in table 6 basically refer to growing media as finished products. As the tables do not cover all EU member states and imported finished products are also received by these, one must conclude that the actual total is higher than 4.389 million m^3 for all the EU member states. Non-EU countries also import peat-based growing media produced in the EU.

The reported amounts of domestically consumed peat reflect very well how importdependent or self-sufficient EU countries are. The data in tables 5 and 6 and other data reported but not shown in these tables are commented on country by country in alphabetical order, sub-grouped into producer and consumer countries.

Table 6: Imported finished products containing peat for domestic consumption.

Country	Year	000's m³	% peat in the product	m³ of peat in the product
'Producer Countries'				
Denmark	2005	250	95	238
Estonia	n/a	0	0	0
Finland	2005	0	0	0
France	2005	1149	96	1103
Germany	2004-5	225	100	225
Ireland	2005-6	0	0	0
Latvia	2005	0	0	0
Lithuania	2005	0	0	0
Poland	n/a	n/a	n/a	200
Sweden	2005	35	90	32
United Kingdom	2005	750	84	630
'Consumer Countries'				
Austria	2005	303	90	273
Belgium	2004	433	90	390
Italy	2005	150	80	120
Netherlands	2005	250	85	213
Spain	2005	1072	90	965
Total				**4389**

7.3.2.1 Producer countries

Of its total raw peat consumption of 0.542 million m³ in 2005, **Denmark** reported just under 60% or 0.323 million m³ to be domestic and almost 40% or 0.219 million m³ from imported sources. In addition 0.250 million m³ of finished products containing an average of 95% peat were imported. There is no use of peat for energy.

Estonia reported a total raw peat consumption of 1.745 million m³ for 2005, all of it being from domestic resources. Of this nearly 80% or 1.386 million m³ were reported to be manufactured as fuel peat**.**

Finland, as mentioned earlier in this report, has huge areas covered with peatlands and has large peat reserves. Thus, Finland is self-supporting and uses domestic peat sources only. The country reported 23.944 million m³ for the production of growing media and fuel peat. Of this amount over 89% was used as energy peat. No finished products were imported by Finland.

France had a total raw peat consumption of 2.572 million m³ in 2005 of which less than 11% came from domestic sources (mainly fen peat). Almost 99% of the total raw peat consumption was used for manufacturing growing media. In addition, 1.103 million m³ of finished products were imported in 2005. This shows that France, as a large producer country of horticultural products, is very much dependent on imported peat and peat-based growing media.

Germany, a long time self-supporting peat and growing media producing country, used 10.525 million m³ of peat for the production of horticultural products in the given period. Due to its restrictive peat extraction regulations, Germany is no longer fully self-supporting and relied on 1.975 million m³ (almost 19%) of imported, mainly weakly decomposed, raised bog peat during the reported statistical year 2004-2005. In addition, Germany imported 0.225 million m³ of finished products as growing media for the professional and hobby markets.

In the reported year-period 2005-2006 **Ireland** had a raw peat consumption of 11.025 million m³. These were domestic peat sources only, as neither imports of raw peat nor finished products were reported. The bulk of the peat used in Ireland goes into energy production.

For 2005 **Latvia** reported a total raw peat consumption of 0.87 million m³, all being domestic peat. Latvia reported that all peat went into the manufacture of growing media. There were no imports of finished peat products to Latvia**.**

Lithuanian raw peat consumption was reported to be 1.632 million m³ in 2005, all of it being domestic material. Only 5,000 m³ of finished products were imported. As Lithuania is not a large consumer of finished peat products and ca. 16% of the total

harvest (0.266 million m³) is needed for energy purposes, it is evident that most of the peat is exported, either as ready-to-use products or peat raw material.

Poland produced a 5-year average of 1.92 million m³ of peat and reported a raw peat consumption of 2.100 million m³ for the production of horticultural media in 2005, of which 0.2 million m³ or close to 10% was imported. A considerable amount of the consumed peat was fen peat; imports consisted of raised bog peat only.

Sweden has vast peatlands and is almost fully self-supporting. The reported 5-year average peat harvest is 3.77 million m³. Peat for energy is imported and raw material peat for horticulture and ready horticultural peat products exported. Since 2001 the value of the import has been higher than the export, making average consumption slightly larger than indigenous production.

The **United Kingdom** could not report data on its national peat production for the years 2001-2005 but gave an estimation of 1.6 million m³ for that time period. For 2005 the United Kingdom reported a total raw peat consumption of 2.719 million m³ for the production of growing media and soil improvers. The UK also reported 0.75 million m³ of imported finished products containing peat for domestic consumption.

7.3.2.2 Consumer Countries

The amounts of peat produced in **Austria** are comparatively negligible with a 5-year average of 45,000 m³. For 2005 Austria reported a total raw peat consumption of 0.175 million m³ of which 77% was imported. There is no energy peat use.

Belgium has neither significant peatland areas nor a peat industry. It does, however, have a growing media industry with a raw peat consumption of 1.333 million m³ reported for 2005. All consumed peat is imported. In addition, 0.433 million m³ of peat-based growing media were imported, 90% of which was peat as a constituent.

There is no peat extraction in **Italy**. As one of the outstanding producer countries of horticultural products, Italy is very much dependent on peat as a growing medium constituent. Its growing media industry is second to Germany in the EU (Schmilewski, 2008). Italy reported a raw peat consumption of 3.9 million m³ for 2005. Its import of peat in finished horticultural products was 0.12 million m³, which is comparatively low, considering that Italy uses more than 4 million m³ of growing media. Italy uses a considerable amount of other materials than peat in growing media.

For 2005 and as a 5-year average the **Netherlands** reported its peat harvest at 50,000 m³ which is insignificant for a country with such an important horticultural industry. This amount is incredibly small compared to the total amount of 4.233 million m³ consumed for the production of growing media for the professional and hobby markets. The amount of imported peat as a constituent of finished horticultural products was reported to be 0.213 million m³, being the main share of the 0.25 million m³ of growing media imported.

Spain has a small peat extracting industry and reported 0.226 million m³ as the 5-year average (2001-2005) for harvested peat, with a small yearly increase from 0.178 million in 2001 to 0.275 m³ in 2005. Imported peat sources used in 2005 were estimated to be 0.967 million m³ resulting in a total raw peat consumption of 1.242 million m³.

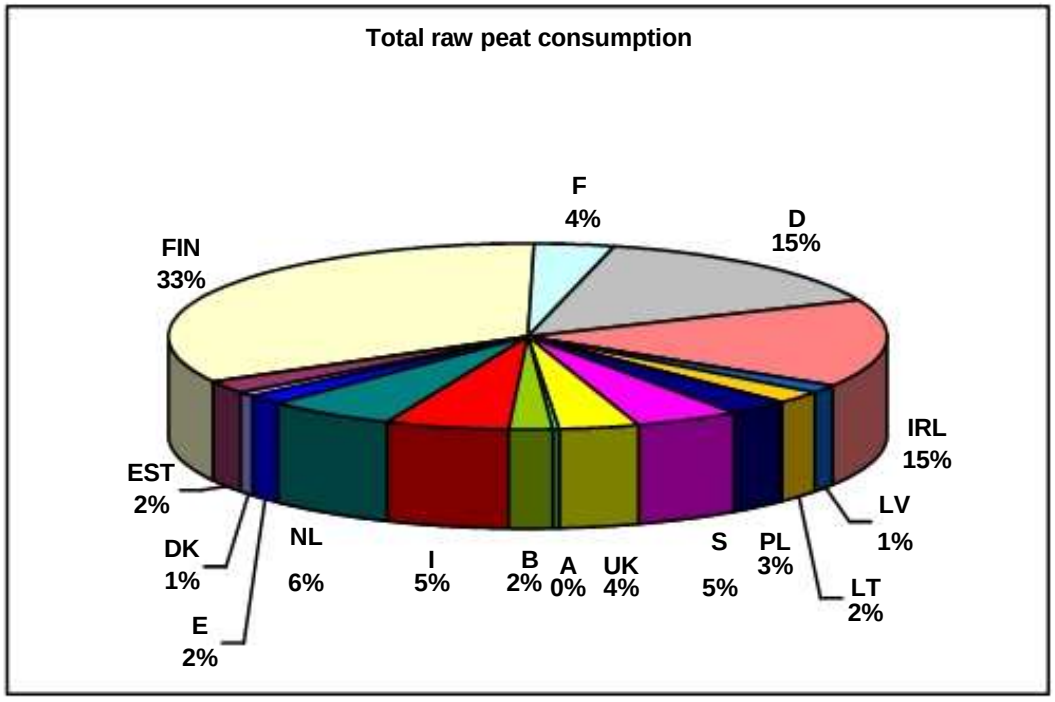


Figure 16: Total raw peat consumption in EU producer and consumer countries in 2005 (2004 for Belgium; 2004-5 for Germany; 2005-6 for Ireland). The total amount of almost 72 million m³ includes peat used for manufacturing all possible peat-based products including peat for energy, growing media, soil improvement and all other uses.

7.4 Peat usage in different sectors in the EU

In the EU peat is mainly used for the production of energy/fuel and growing media. The use of peat for soil improvement and other uses (see chapter 6.2) are of much less importance. Table 7 reflects the usage of peat in the four sectors listed for the year 2005. Due to lack of statistical data and even reliable estimations in some countries, not all figures in Table 7 are as precise as required by EPAGMA when distributing the questionnaire. Poland, for instance, has not reported any peat usage at all. This statement is actually incorrect, as Poland does use quite a substantial amount of peat for the production of growing media (Schmilewski, 2008).

There are four main producer and user countries of energy/fuel peat: Estonia, Finland, Ireland and Sweden. In addition, Lithuania and even the United Kingdom reported production of fuel peat.

Table 7: Peat usage in production of peat based products in 000's cubic metres by sector

Country	Growing Media (Professional and Hobby)	Soil Improvers (Professional and Hobby)	Energy	Uses other than horticulture and energy	Total
'Producer Countries'					
Denmark	542	0	0	0	542
Estonia	n/a	n/a	1386	n/a	1386
Finland	944	850	21400	750	23944
France	2541	11	0	20	2572
Germany	8390	1270	0	865	10525
Ireland	972	25	10028	0	11025
Latvia	870	0	0	0	870
Lithuania	1366	n/a	266	n/a	1632
Poland	n/a	n/a	n/a	n/a	n/a
Sweden	1030	70	1900	270	3270
United Kingdom	2548	147	21	3	2719
'Consumer Countries'					
Austria	155	20	0	0	175
Belgium	1153	180	0	0	1333
Italy	3600	300	0	0	3900
Netherlands	3953	280	0	0	4233
Spain	1240	0	0	2	1242
Total	**29304**	**3153**	**35001**	**1910**	**69368**

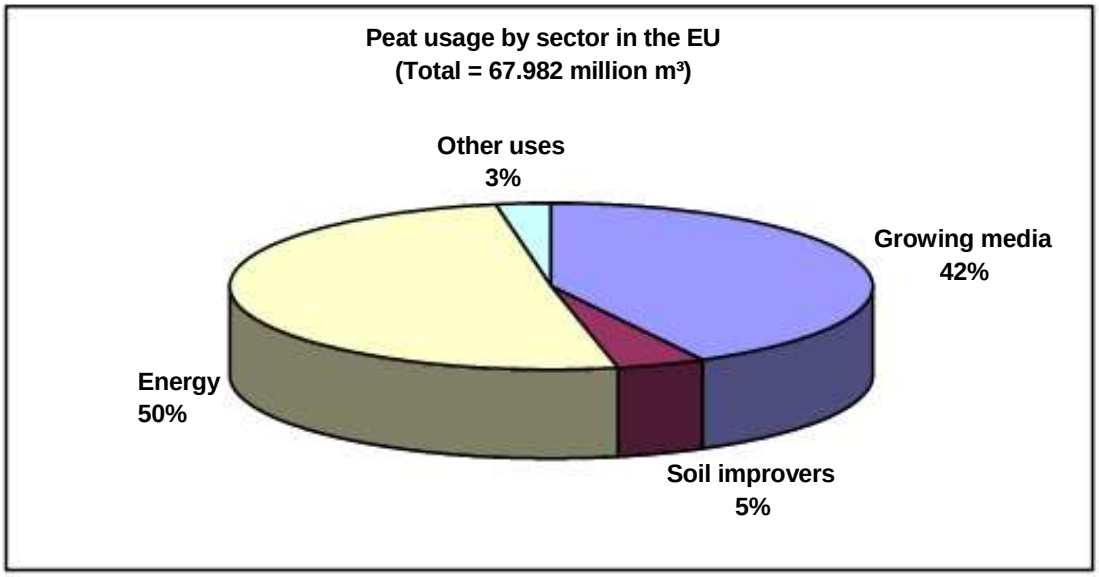


Figure 17: Peat usage in the EU based on data obtained from main producer and consumer countries. The reported total use of peat was 67.982 million m³ in 2005.

7.4.1 Amount of peat used for the production of growing media for professional horticulture

The reported amount of growing media for professional horticulture produced in the selected producer and consumer countries in 2005 totalled 22.113 million m³. Of this amount 3.171 million m³ or 14.3% consisted of non-peat materials, meaning that 85.7% of that volume was peat (table 8; figure 18). It was not reported if these growing media were only peat-based, mixes of these materials or even peat-free. The data show that peat is the predominant growing medium constituent used in the EU.

Table 8: Peat and non-peat usage in professional growing media in 000's cubic metres

Country	Peat usage by horticultural segment							
	Flori-culture	Hardy Nursery Stock	Vege-table growing	Fruit growing	Mush-room casing	Other uses	Total peat volume	Total non-peat volume
'Producer Countries'								
Denmark	332	30	0	0	10	0	372	28
Estonia	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Finland	280	40	240	0	0	4	564	31
France	742	431	146	29	15	96	1459	602
Germany	1740	410	2270	2	20	0	4442	330
Ireland	83	125	45	21	4	0	278	0
Latvia	522	174	174	0	0	0	870	0
Lithuania	419	0	823	0	0	74	1316	14
Poland	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sweden	110	45	20	5	0	100	280	120
UK	558	340	150	13	99	0	1160	189
'Consumer Countries'								
Austria	10	2	0	0	0	0	12	0
Belgium	240	250	140	60	15	263	968	162
Italy	1800	720	360	36	36	0	2952	843
Netherl.	1630	526	618	64	375	180	3393	762
Spain	438	175	175	44	44	0	875	90
TOTAL	**8904**	**3268**	**5161**	**274**	**618**	**717**	**18942**	**3171**

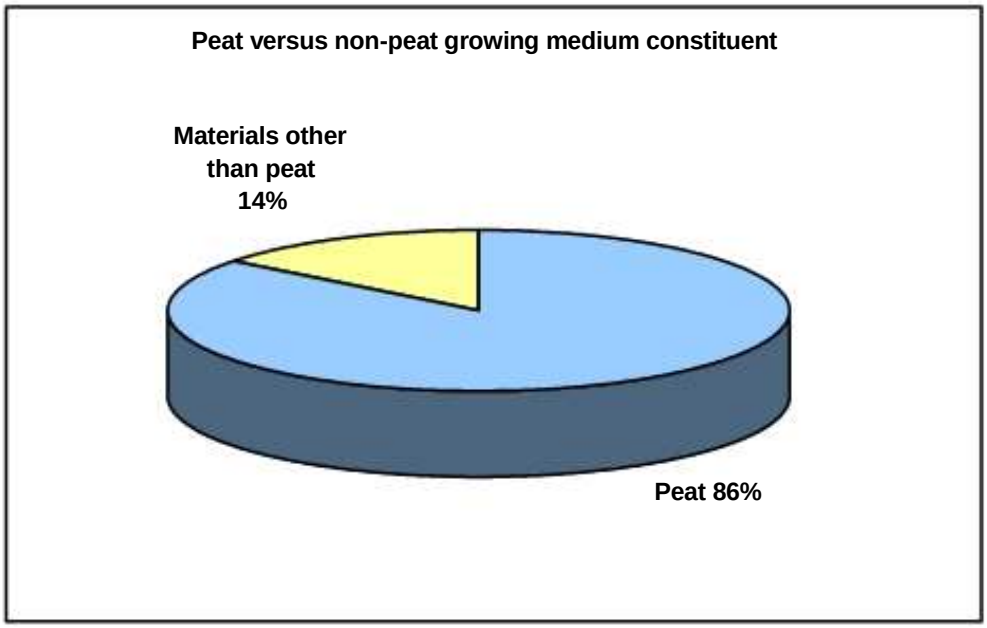


Figure 18: Percentage of the total reported amount of 22.113 million m³ of peat and non-peat materials used in 2005 for the manufacture of growing media for professional horticulture in the EU.

7.4.1.1 Floriculture

Hundreds of different species of potted flowering plants, bedding plants, foliage plants and cut flowers are produced in the EU. Looking at the different horticultural segments, the largest portions of growing media are produced for floriculture (figure 19). 48% or 8.904 million m³ of all the peat used for growing media production goes into this segment.

In comparison Italy, Germany and the Netherlands are the three main user countries of peat in this segment (table 8). It is interesting to note that Italy and the Netherlands are totally dependent on the import of peat for manufacturing growing media, as these two countries basically have no peat extraction of their own. Floriculture is a segment in which materials other than peat are sometimes part of the mix. Percentages of 10-30% are common for growing-on a number of crops.

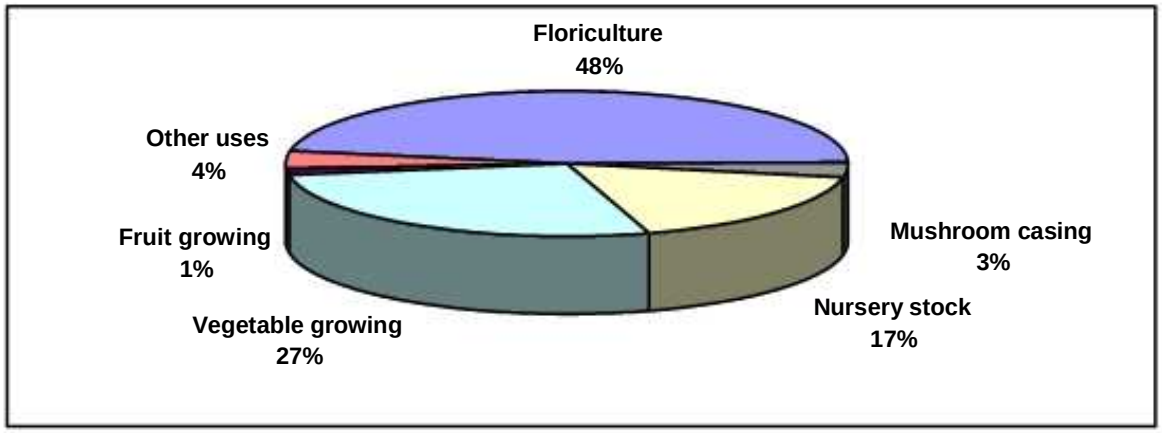


Figure 19: Percentages of the reported total of 18.942 million m³ of peat used for manufacturing growing media for different segments of professional horticulture in the EU in 2005.

7.4.1.2 Vegetable growing

Of the reported total of 18.942 million m³ of peat used for producing growing media for commercial horticulture in 2005, 27% or 5.161 million m³ were used for the production of media for growing vegetables (figure 19). This amount is considerable, as most growing media used in this segment are applied for growing young plants in multi-cellular trays or pressed peat blocks. After a few weeks of growing in the greenhouse these seedlings are either grown-on in greenhouse soil or in the open field. Due to their usually inferior physical and chemical properties, only a small amount of materials other than peat can be used in this segment.

7.4.1.3 Mushroom growing

For 2005 the reported amount of peat used for manufacturing casing soil for mushroom casing was 0.618 million m³ or 3% of the total peat amount used to produce growing media in the EU. The main producer countries of casing soil are the Netherlands, the United Kingdom and Italy (table 8; figure 19).

7.4.1.4 Nursery stock

Nursery stock production is also quite dependent on peat, in particular when growing young trees and shrubs. Although young nursery stock plants are fairly sensitive to improper media, well-rooted plants are often grown-on in straight peat-based media or media composed of peat with the addition of 10-40% of other constituents. Depending on the location, growth conditions and availability of other materials, even larger amounts of materials other than peat can be used. Plant containers of 1-5 and even 10 litres or more in size are quite common and require large amounts of media. Peat, however, is the most important constituent of nursery stock media. The data coordinators reported a total of 3.268 million m³ of peat used for the production of growing media in this segment, which represents 17% of all horticultural peat used for growing media production.

7.4.1.5 Fruit growing

Only 1% of the total or 0.274 million m³ of peat was used for the production of growing media for fruit production in 2005. Cultivation of, for instance, strawberries in countries like Belgium, France and the Netherlands is quite common and requires socalled grow bags or other containers filled with peat, sometimes blended with coir, perlite or other materials.

7.4.1.6 Soil improvement in professional horticulture

As explained in chapter 6.1.1.6, professional growers and the landscape horticulture segment often require soil improvement measures. Several organic and mineral-organic materials are produced for this area of application. Producer and consumer countries reported the amounts of peat used for the production of soil improvers, which may have been produced by mixing with other materials (table 9). In the 11 countries listed the total use of materials other than peat (3.855 million m³) is more than three times as high as the amount of peat used for soil improvement

(1.229 million m³). In the peat producer countries Finland and Germany the amount of produced peat-based soil improvers is much higher than the use of other materials. In Spain a lot of organic material is composted and used as a soil improver.

Table 9: Peat and non-peat materials used for the production of soil improvers for professional horticulture and landscaping in 000's cubic metres

Country	Peat	Non-peat
'Producer Countries'		
Denmark	0	75
Finland	500	30
France	1	374
Germany	400	120
Ireland	10	0
United Kingdom	13	1201
'Consumer countries'		
Austria	0	50
Belgium	170	200
Italy	30	60
Netherlands	105	945
Spain	0	800
Total	**1229**	**3855**

7.4.1.7 Other horticultural applications

Unspecified other horticultural uses were reported from Finland (4,000 m³), France (96,000 m³), Lithuania (74,000 m³), Sweden (100,000 m³), Belgium (263,000 m³) and the Netherlands (180,000 m³), amounting to 3% of the total amount of peat used for the production of growing media in the EU.

7.4.2 Hobby market

As for professional growing media production, Estonia and Poland, two producer countries, were unable to provide data on peat and non-peat usage for the hobby market growing media sector. The reported data for all the other countries are given in table 10.

Table 10: Peat and non-peat usage in production of growing media and soil improvers for the hobby market in 000's cubic metres

	Growing media		Soil improvers	
Country	**Total peat volume**	**Non-peat volume**	**Total peat volume**	**Non-peat volume**
'Producer Countries'				
Denmark	170	5	0	40
Estonia	n/a	n/a	n/a	n/a
Finland	380	25	350	15
France	1082	1203	10	115
Germany	3948	300	790	1000
Ireland	694	80	15	0
Latvia	0	0	0	0
Lithuania	50	1	0	0
Poland	n/a	n/a	n/a	n/a
Sweden	750	70	70	150
United Kingdom	1388	513	134	1107
'Consumer Countries'				
Austria	143	20	20	25
Belgium	185	277	10	30
Italy	648	830	0	0
Netherlands	560	140	175	175
Spain	365	1100	0	200
Total	**10363**	**4564**	**1574**	**2857**

7.4.2.1 Growing media

Of the reported total of 14.927 million m³ of growing media produced in the producer and consumer countries listed peat represents 69.4% of all constituents used, meaning that 30.6% are constituents other than peat. Compared with the 14.3% of materials other than peat used for the production of professional growing media, this figure is more than twice as high. The reason for this can be seen in the fact that end users do not run the risk of crop failure by applying higher percentages of materials in a mix other than peat when seeding, transplanting and growing on bedding plants, houseplants, etc. In addition to that, growing media producers are more easily willing to blend other materials into their peat-based media or even produce peat-free media, because the risk of large-scale crop failure practically does not exist.

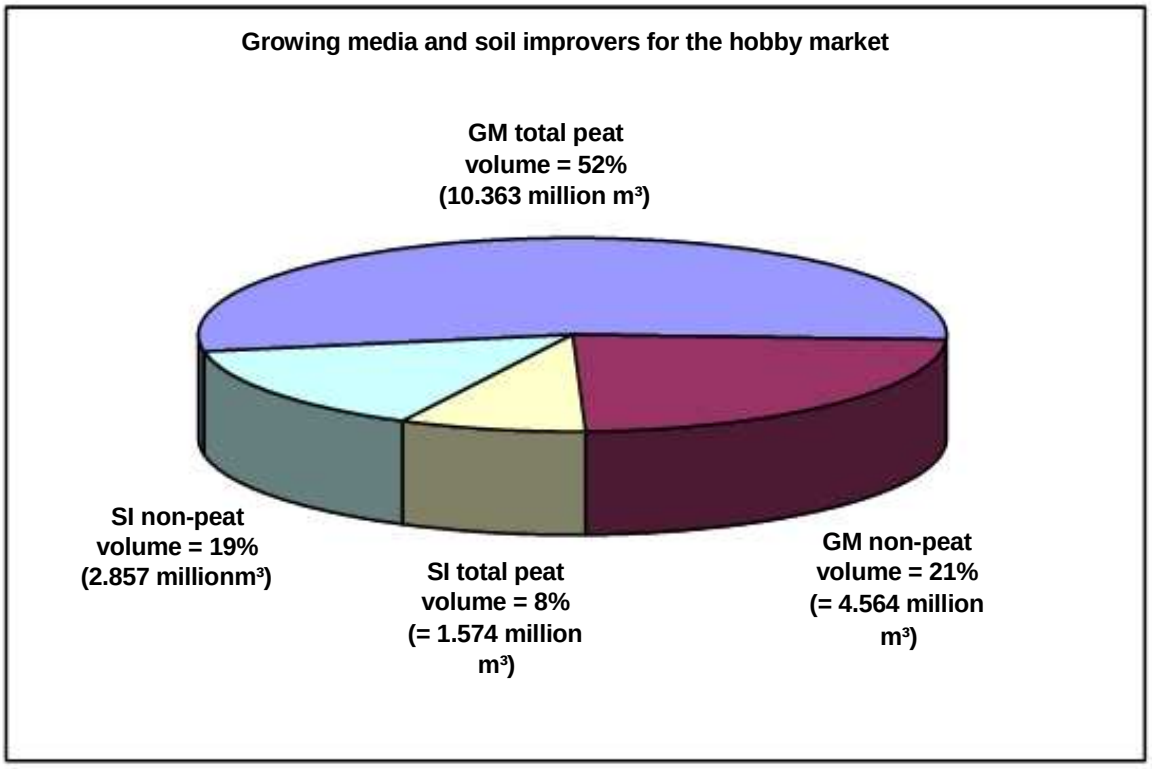


Figure 20: Percentages and volumes of the total reported amount (= 19.4 million m³) of materials used in the EU in 2005 for the production of growing media (GM) and soil improvers (SI) for the hobby market.

7.4.2.2 Soil improvement

Together the producer and consumer countries reported a total of 4.431 million m³ of soil improvers produced in their countries for the hobby market in 2005 (figure 20). Of this amount nearly 36% was peat and 64% non-peat materials.

7.4.3 Fuel and power generation

Whilst fuel peat is usually quantified in tons, it was requested that for consistency with other data throughout, to convert the fuel peat contribution from tons to cubic metres. It was requested to state the conversion factor (that is, cubic metres per ton). The reported conversion factor for Estonia and Ireland is 3.0, 3.2 for Finland and 5.0 for Lithuania. (Sweden and the United Kingdom did not report conversion factors.) Table 11 shows the amounts of energy peat produced in these six EU countries. Although some amounts of energy peat are exported from producing to consuming countries, in general, fuel energy peat is combusted in the country of production. The total amount of energy peat produced in the EU in 2005 was 35.001 million m³ which is 62.5% of the total amount of peat extracted for all other purposes in that year.

Table 11: Energy peat production in EU countries in 2005

'Producer Country'	Energy peat production in '000's m³ (converted from tons to m³)
Estonia	1386
Finland	21400
Ireland	10028
Lithuania	266
Sweden	1900
United Kingdom	21
Total	**35001**

7.4.4 Other applications

Peat is a very versatile material, therefore its usage is not restricted to horticultural or energy applications (chapter 6.2). In 2005 several country coordinators reported the use of peat to produce peat-based products for various other fields of application (table 12). All together 1.91 million m³ of peat was used in areas other than horticulture and energy.

Table 12: Use of peat for the production of peat-based products for non-horticulture and non-energy application in 2005

'Producer Countries'	Peat volume in '000's m³	Area of application
Finland	750	Animal bedding, bulky component mixed with sludges, etc.
France	20	Pig feed
Germany	865	Activated carbon, balneology, medicine
Spain	2	Not specified
Sweden	270	Animal husbandry, landscaping products
United Kingdom	3	Whisky production
Total	**1910**	**All areas other than horticulture and energy**

7.5 Growing media sales

The data received in this section of the questionnaire gives information on the degree to which home produced peat products are sold at home and abroad and allows quantification of the average ex works selling price in Euro per cubic metre. Based on this information it is possible to estimate the value of the market for peat-based products within the EU (excluding transport).

Table 13: Marketed growing media and average sale value (ex works)

Market/export	m³	€/m³ ex works
Home market	26,588,360	33,46
EU exports	9,189,800	30,77
Non-EU exports	1,348,070	28,79

For this survey the ten producer and five consumer countries reported a marketed total of 37,126,230 m³ of growing media (table 13). (The data supplied in table 13 must be treated with caution as a few of reporting countries were unable to supply the required data. Other countries supplied data, but these seemed to be unrealistic which is why the ex works values can only be indication values.) Of this total 26,588,360 m³ were home marketed having a mean ex works value of € 33.46/m³. Another 9,189,800 m³ were EU exports with a mean ex works value of € 30.77/m³. The smallest portion of the total marketed amount of growing media were non-EU exports being 1,348,070 m³ with a mean market value ex works of € 28,79/m³.

Unfortunately, Poland was unable to provide any sales figures data. Estonia provided on sold growing media data, but no figures on product value ex works. Also several other countries could not provide detailed data, e.g. the United Kingdom. Due to this lack of information and also because other (smaller) consumer countries like Portugal and Greece as well as some non-listed Eastern European countries might have small-scale industrial production of growing media, it can be estimated that the total amount of industrially produced growing media in the EU is close to 40 million m³.

Table 14 summarizes the amount of growing media produced (= home market + EU exports + non-EU exports) in each of the reported EU countries. Table 14 also reflects the mean ex works price in €/m³ of growing medium. Based on these data the ex works growing media market value in millions of Euro was calculated. For the countries listed (excluding Poland, Estonia and other countries with smaller industrial production) the calculated ex works market value of growing media produced in the EU in 2005 was over €1.262 billion.

Table 14: Growing media (professional and hobby) market value

Country	m^3 of product produced	Mean ex-works price in €/m^3	Ex-works market value in millions of €
'Producer Countries'			
Denmark	575,000	30.6	17.6
Estonia	87,230	n/a	n/a
Finland	1,000,000	28.4	28.4
France	4,346,000	40	173.8
Germany	9,020,000	26.5	239.0
Ireland	1,052,000	24	25.2
Latvia	870,000	21	18.3
Lithuania	1,381,000	22.72	31.4
Sweden	1,220,000	30.4	37.1
United Kingdom	3,250,000	37.5	121.9
'Consumer Countriess'			
Austria	175,000	38.8	6.8
Belgium	1,592,000	35	55.7
Italy	5,273,000	50	263,7
Netherlands	4,855,000	30.17	146,5
Spain	2,430,000	40	97.2
Total	**37126,23**		**1 262.6**

7.6 Sales of other peat-based product groups

Compared with the other peat-based product groups (table 15) growing media have the highest ex works market value of the total, the total being over €1.686 billion. Growing media provided 75%, soil improvers 12.5%, energy peat 12.0% and other peat-based products 0.5% of the total ex works market value of all products produced.

Table 15: Comparison of ex works market values for growing media, soil improvers, peat for energy and for other uses in millions of € in 2005

Country	Growing Media (all kinds)	Soil Improvers (all kinds)	Energy	Uses other than horticulture and energy	Total
'Producer Countries'					
Denmark	17.6	0.6	0.0	0.0	18.2
Estonia	n/a	n/a	n/a	n/a	n/a
Finland	28.4	16.1	68.5	4.7	117.6
France	173.8	7.5	0.0	1.0	182.3
Germany	239.0	45.4	0.0	n/a	284.5
Ireland	25.2	0.8	114.6	0.0	140.7
Latvia	18.3	0.0	0.0	0.0	18.3
Lithuania	31.4	0.0	1.4	0.0	32.8
Poland	n/a	n/a	n/a	n/a	n/a
Sweden	37.1	6.2	20.9	3.0	67.1
United Kingdom	121.9	66.3	0.3	0.1	188.5
'Consumer Countries'					
Austria	6.8	1.7	0.0	0.0	8.5
Belgium	55.7	4.9	0.0	0.0	60.6
Italy	263.7	9.0	0.0	0.0	272.7
Netherlands	146.5	31.0	0.0	0.0	177.4
Spain	97.2	20.0	0.0	0.2	117.4
Total	**1262.6**	**209.5**	**205.7**	**8.9**	**1 686.7**

7.7 Direct employment in the peat and growing media industry

One major economic impact of the peat and growing media industry is employment of workforces in rural areas and their local multiplier effect due to wages and salaries.

This chapter gives an estimate of the number of full time employees involved in the production, processing, development, marketing and sales of peat and peat-based horticultural products in EU countries. Transport is excluded as most of this work is contracted.

Company staff listed in table 16 include

- administrative staff
- part time employees reported as full time equivalents
- that proportion of the personnel who are actively dealing with peat matters (relevant to staff who are not only involved with peat products)

Table 16: Full-time direct employees in extraction, manufacture and sales of horticultural peat products only

Country	Employees
'Producer Countries'	
Denmark	140
Estonia	1,100
Finland	500
France	500
Germany	2,380
Ireland	292
Latvia	1,753
Lithuania	1,262
Poland	*300
Sweden	330
United Kingdom	800
'Consumer Countries'	
Austria	25
Belgium	294
Italy	385
Netherlands	407
Spain	248
TOTAL	**10,716**

*EPAGMA estimation

Peat extraction and the production of growing media also have an indirect impact on related secondary industries. These are an integral part of the peat utilization and growing media production chain. Jobs are indirectly supported and created in ancillary industries which provide fertilizers, liming materials, buffering materials, binders, wetting agents and biological products for blending into growing media. Since peat bogs are generally located in remote regions, transportation from peat

works and growing media production sites to growers and retailers is essential and creates jobs in shipping companies. Once a peat and/or growing media plant is fully operational, transportation becomes an important element in the economic wellbeing of the community (Hood, 1994). Employment spin-offs also occur in construction industries, machine construction, equipment supply, etc. Hood (1994) points out that R&D in the peat and growing media industry has three separate elements to it. One is the search for new and environmentally friendly uses of peat. The second element is to find ways to reclaim and/or restore cut-over peatbogs and the third is research in the horticultural use of peat. The peat and growing media industry supports internal R&D but also outsources parts of these elements, thus helping to sustain ancillary businesses, organizations and research institutes.

8 The horticultural industry in the EU

8.1 Databases

The following description of the horticultural industry is based on intensive data research. It was taken from statistical databases and scientific literature and complemented by expert interviews and the long-standing experience of CO CONCEPT.

Data research was carried out accurately, however it should be noted that there is no complete database of horticultural activities worldwide. Furthermore, methods of collecting data may vary from country to country, e.g. actualisation of data is not done simultaneously, terminology differs in original sources, and some data is not available. In order to provide an overview of the sector the assessment involves using statistical data from different years. In each case the most recent information is used.

Main data sources are:

- AIPH, International Association of Horticultural Producers
- ZMP, Zentrale Markt- und Preisberichtsstelle für Erzeugnisse der Land-, Forst- und Ernährungswirtschaft, Germany
- World Bank statistical database
- EUROSTAT statistical database
- FAO, Food and Agricultural Organization of the United Nations ▪

and national databanks of different countries

Although available statistical data is incomplete, the information given allows for an adequate review of the horticultural industry in terms of dimensions and interrelationships.

8.2 Importance of European Horticulture

Horticulture is an important section within the agricultural sector. It focuses on products intended for fresh consumption, namely fruit and vegetables, or for decorative purposes, namely trees, pot-plants and cut flowers. In general all products are perishable, high value products with a high potential added value compared to main agricultural crops.

Compared to agricultural production, horticulture is more intensive. For example: 1% of the agricultural area of Germany is used for horticultural production, achieving 10% of the total agricultural production by value.

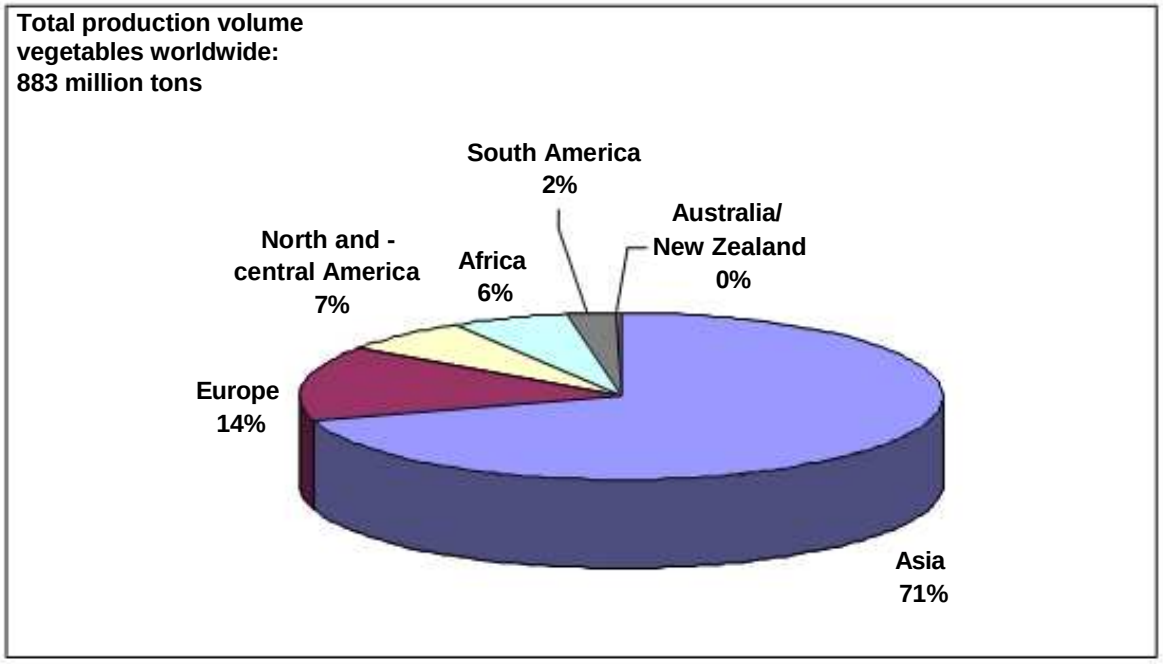
The horticultural sector can be characterized as a market-oriented sector with little direct government influence. The international trade of horticultural products is highly developed. European horticulture is highly intensive.

Regarding the development of worldwide horticulture a displacement of production areas to climatically favourable regions is evident. This process correlates with efforts to achieve lower production costs, especially the two main cost factors, energy and the labour force. The production of cut flowers shifts geographically from the northern hemisphere to Africa and South America, plant production to Eastern Europe.

In 2006 the total import value of the EU of all products worldwide is specified as €1.4 billion with a share of 6.7% resulting from agricultural crops. The equivalent total export value adds up to €1.2 billion with an agricultural share of 6% (EUROSTAT).

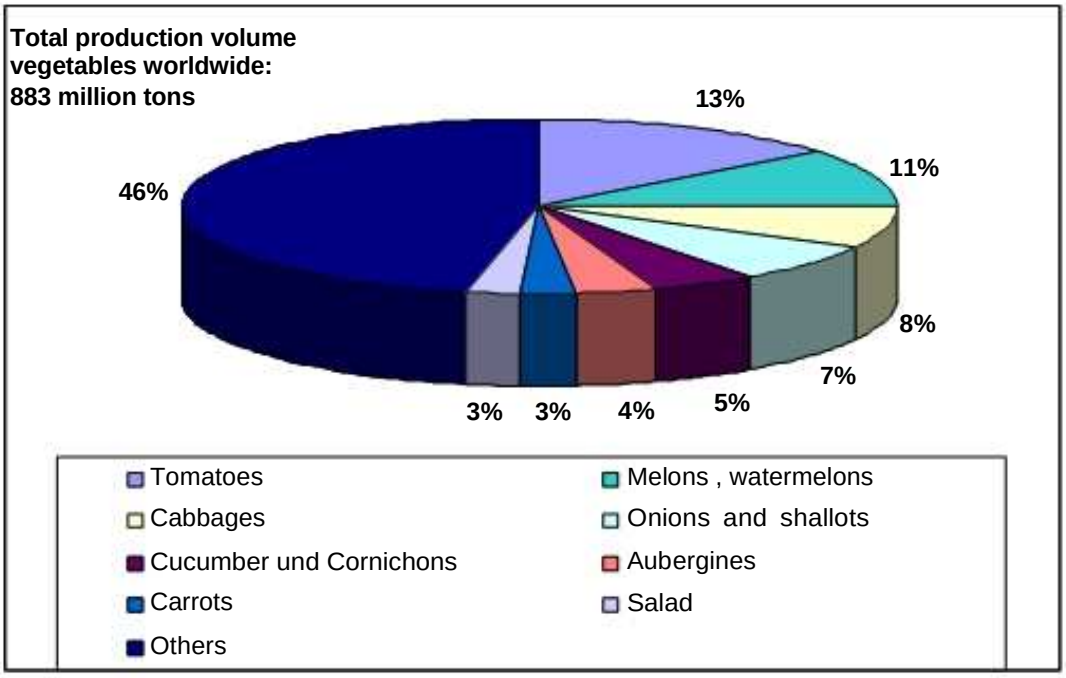
The trade value of fresh fruits and vegetables worldwide is estimated as having reached €57.0 billion in 2002 (World Bank). Fresh fruits and vegetables play an important role for national self-supply and as products for external trade. Export products are seen as off-season supply and complete the internal production. The northern hemisphere countries import large quantities of fruits and vegetables during the winter season.

In 2005 the world **production of vegetables** reached a peak value of 883 million tons. The production volume has continuously increased over recent years. Europe is the second largest producer, adding ca. 14% to the world production of vegetables. Figure 21 provides an overview of the production volume of vegetables according to variety. Compared to other horticultural product sections, vegetable production offers a wide range of products. The main products cover only half of the total.



Source: ZMP 2007a

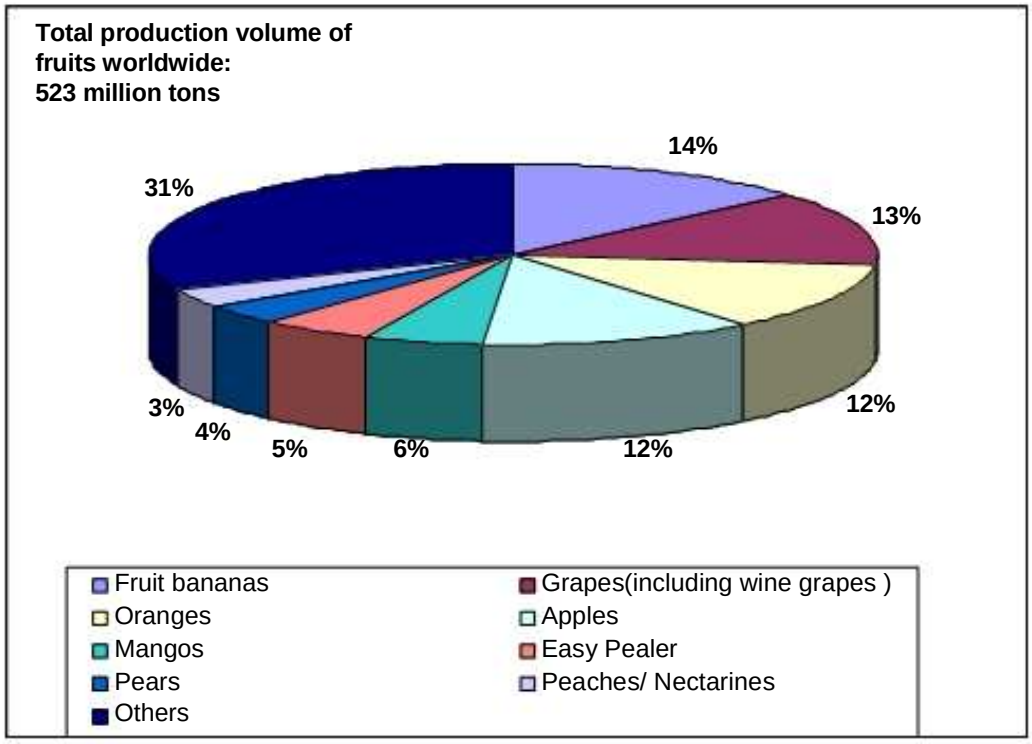
Figure 21: Worldwide production of vegetables 2005 (countries)



Source: ZMP 2007a

Figure 22: Worldwide production of vegetables 2005 (vegetable category)

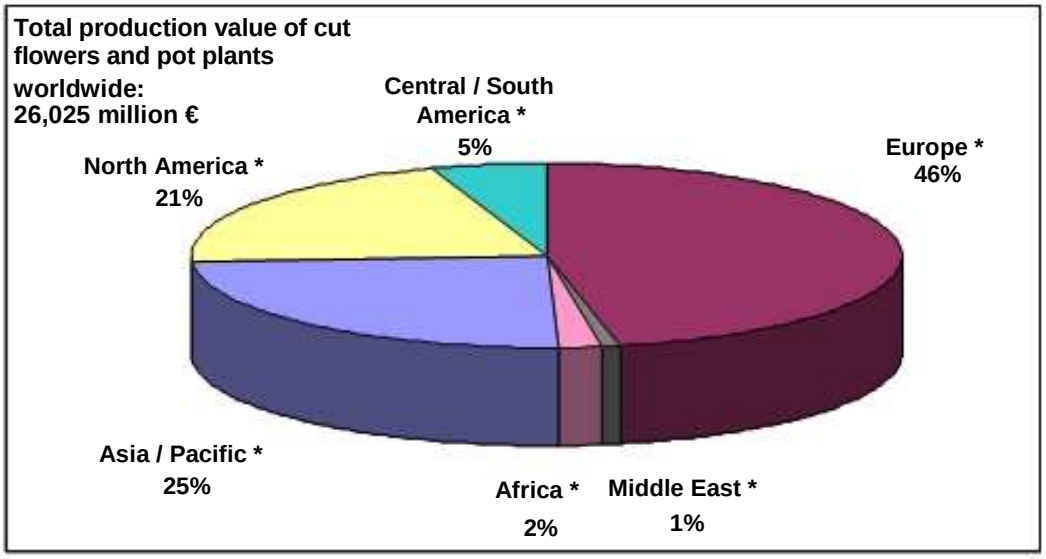
The fruit sector is shown to complete the picture of horticultural production worldwide, although the use of peat in fruit production is limited. 523 million tons of **fresh fruit** were produced worldwide in the year 2006. Production volume increased continuously from 472 million tons in 2001. Figure 23 shows the production volume of the main fruit varieties.



Source: ZMP 2007b

Figure 23: Worldwide production of fruits 2006 (Fruit category)

The production area of pot plants and cut flowers worldwide covers at least 609,938 ha, located partly in the open field and partly under glass. Databases do not represent all states of the world; however they provide a rough overview of continental dimensions as shown in figure 24. The most important countries are represented. Europe accounts for 46% of worldwide production, the biggest market share, although only approximately 9% of the production area is located on this continent. Its high production value can be explained by very intensive cultivation under glass.



Africa*: (Ethiopia, Ivory Coast, Kenya, Morocco, South Africa, Tanzania, Uganda, Zambia, and Zimbabwe)

Asia/Pacific*: (Australia, China, Hong Kong, India, Japan, Korea (Republic), Malaysia, Philippines, Singapore, Chinese Taipei, Thailand)

Centr./South America*: (Brazil, Colombia, Mexico, Ecuador, Costa Rica, Dom. Republic, and Guatemala)

Europe*: (EU15 and Czech Republic, Hungary, Norway, Poland, Switzerland)

Middle East: (Israel, Turkey)

North America*:(Canada, United States)

Source: AIPH 2007

Figure 24: Worldwide production value of cut flowers and pot plants

In 2005 world exports of ornamental horticulture made up of cut flowers and pot plants are estimated as having reached €9.9 billion. Flowers, pot plants and nursery tree products are of significant economic importance.

As in the fruit and vegetable sector, Europe plays a major role in the production of flowers and pot plants. Furthermore, Europe is the biggest importer of flowers and plants due to high consumption, and high production costs in the particular case of cut flowers.

8.3 Horticulture in the EU

To quote the World Bank (2004) the EU market is “one of the world’s largest markets for fresh horticultural and floricultural products. This market has been growing steadily in quantity and quality for the past two decades”.

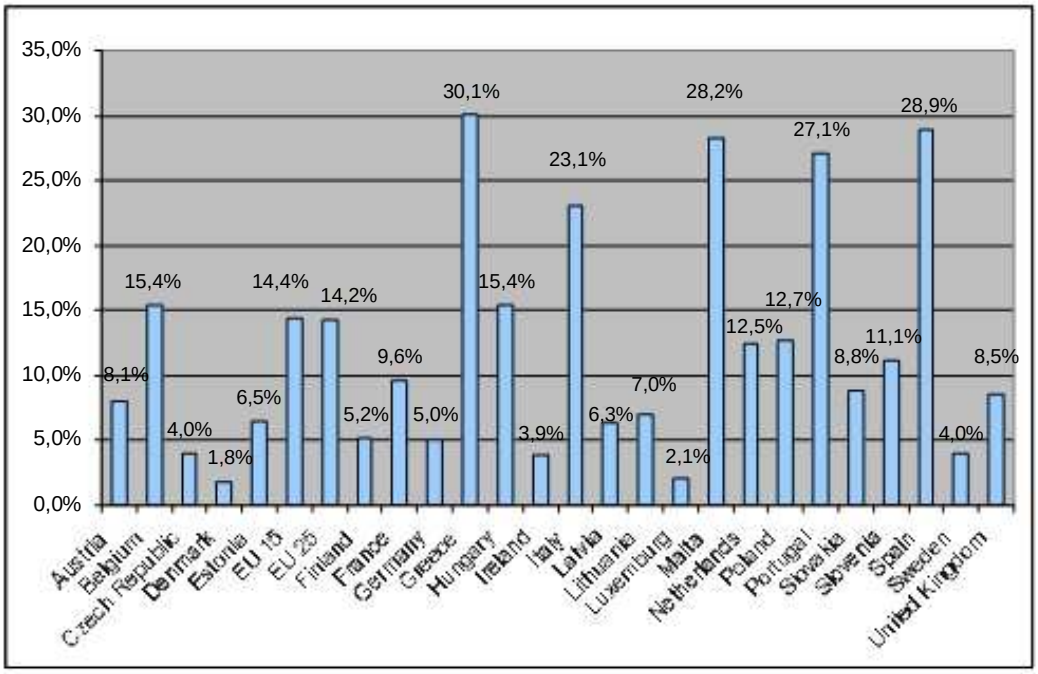
The traditional EU market for horticultural products has changed radically due to consolidation and growth organized supermarket chains. The related structural change is still going on, affecting the wholesale market and supply chains as well as horticultural firms.

With regard to qualitative improvements, implementation of international food safety and quality management systems elaborated and introduced in the EU, have to be mentioned. Quality systems with sustainable impact on the horticultural industry are “Global-Gap” (former: Eurep-Gap) for all agricultural products, “Qualität und Sicherheit” for all fresh products meant for consumption and “MPS” for cut flowers and ornamental plants.

8.3.1 Fresh fruits and vegetables

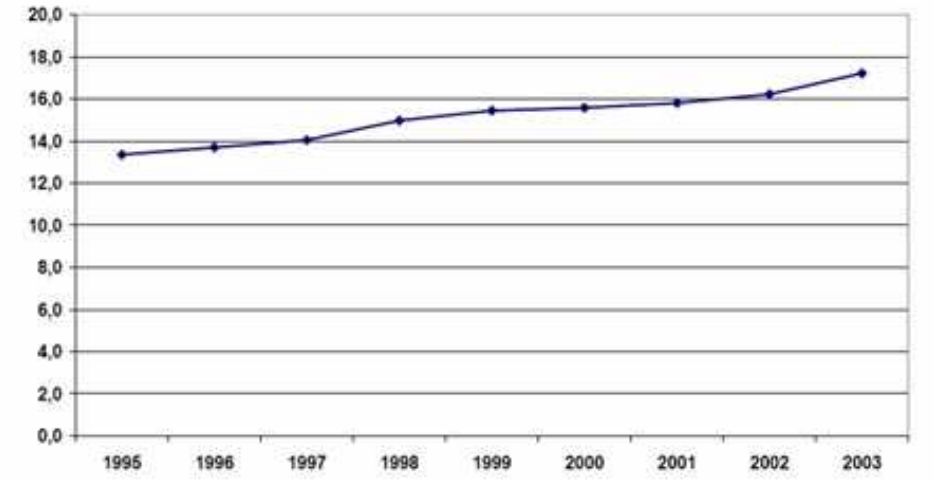
For a better understanding of the economic relevance of horticultural activities in the EU figure 25 shows the share of value of the fruit and vegetable sector in the total agricultural production. Although the usage of peat for fruit production is mostly limited to cultivate a certain amount of young plants, facts and figures on fruit production are presented, too, in order to provide a general view of the horticultural market. The average share for the EU 25 reached approximately 14% (2000-2002), and increased to approximately 17% for the EU 27 (2003-2005). As presented in figure 26 the average share continually increased from 13.4% to 17.2% in the period of 1995 to 2003. The major producing regions of the EU are in Spain Andalucia (a 28.3% share of fruit and vegetable production in total agricultural production), Murcia (36.1%), in France Provence Alpes Côte d’Azur (42.0%), in Italy Emilia-Romagna (24.2%), Campania (42.4%), Puglia (42.4%) and Sicilia (47.8%). Considering that the

vegetable and fruit sector in the EU 25 occupies approximately 4% of the agricultural land (EU Commission 2004a), it is obvious that the sector is based on a profoundly intensive production with a high turnover per unit of area.



Source: European Commission 2004a

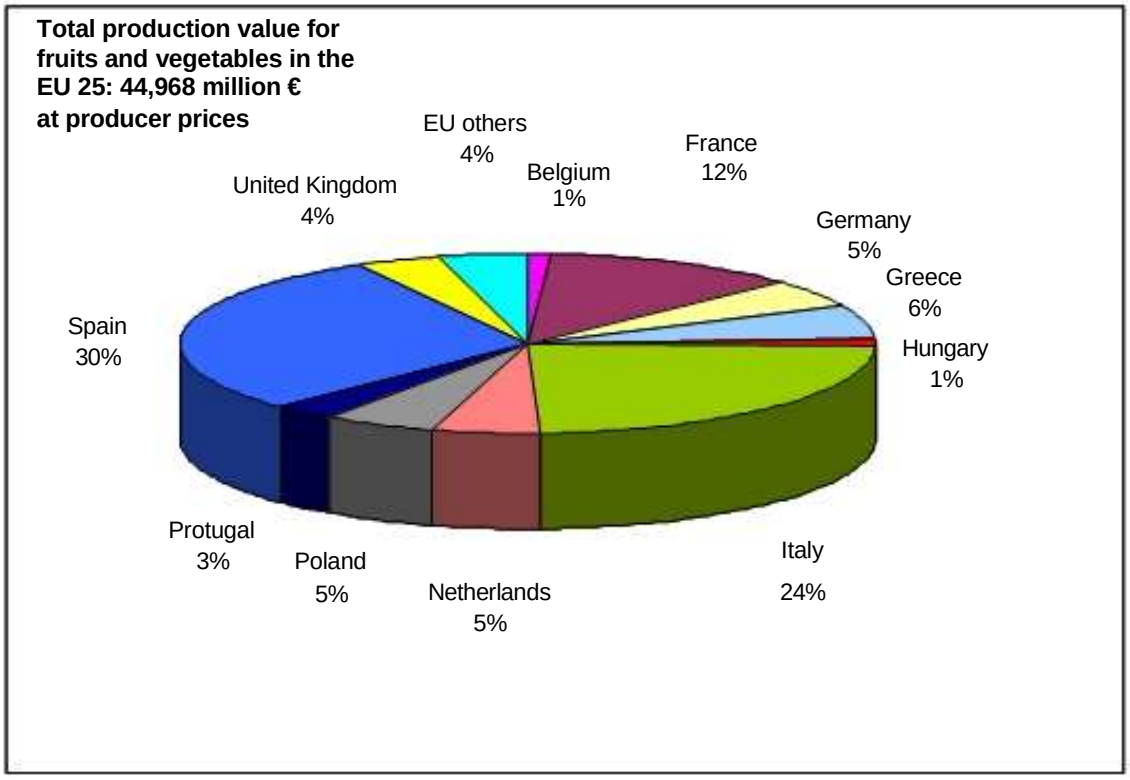
Figure 25: Share of fruit and vegetable production in total agricultural production (value %, 2000-2002)



Source: European Commission 2004b

Figure 26: Increase of the average share of fruit and vegetable production in total agricultural production in the EU 15 (value %)

The total production value of fruits and vegetable in the EU25 in 2005 is stated as €44,968 million at producer prices (European Commission 2007). As figure 27 shows Spain and Italy contribute more than 50%.

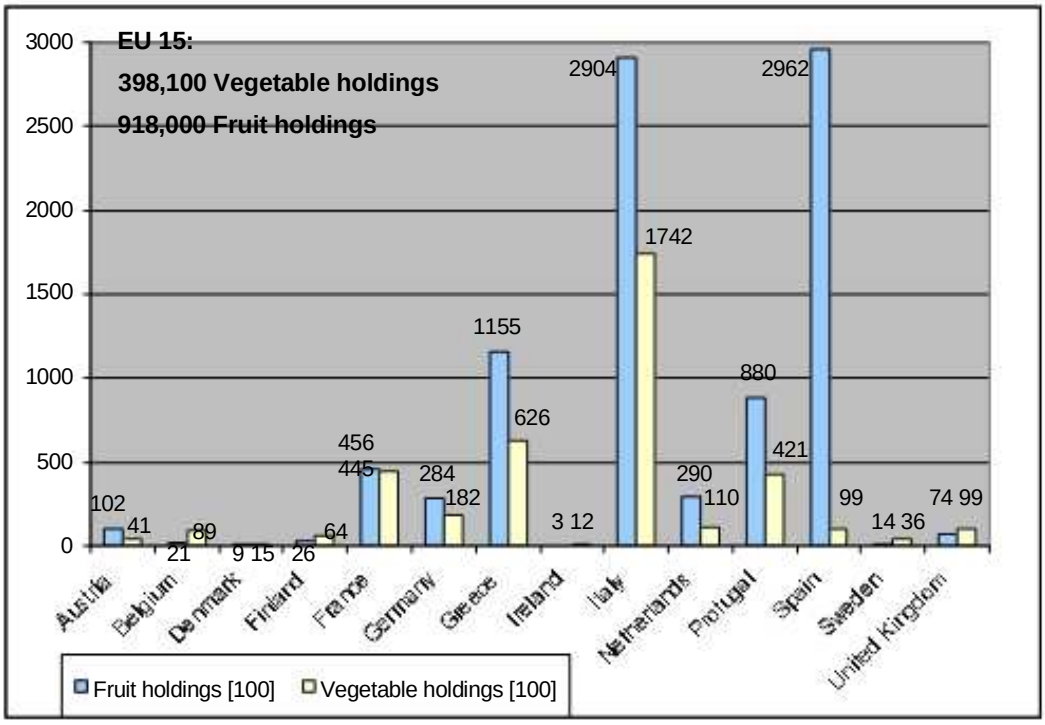


Source: European Commission 2007

Figure 27: Member States' share in the total production value for fresh fruit and vegetables in the EU 25 (2005)

The number of horticultural firms specialising in cultivating vegetables totalled 398,100 in 2003 for the EU 15. Figure 28 provides an overview of the location of fruit and vegetable holdings. A comparison between the agricultural censuses in 1990 and 2000 (table 17) underlines the structural changes in the sector: fewer firms cultivate larger areas of land (European Commission 2004b). The number of holdings specialising in growing vegetables decreased from 298,730 to 212,300. Firms which grow vegetables and fruits decreased from 990,400 to 750,000. During this decade the total area for cultivating vegetables increased by 50,000 ha. The average production area for vegetables increased from 16.5 to 17 ha.

The vertical specialisation of vegetable growers is almost complete: most production companies do not propagate vegetables by themselves anymore. Due to the bioboom larger production firms for organic farming occur. Growth should also be mentioned with regard to potted herbs, since food chains offer potted herbs as a "one-way-article" in their outlets (estimate by a market expert).



Data not found for Luxemburg.
Source: BMELV 2006

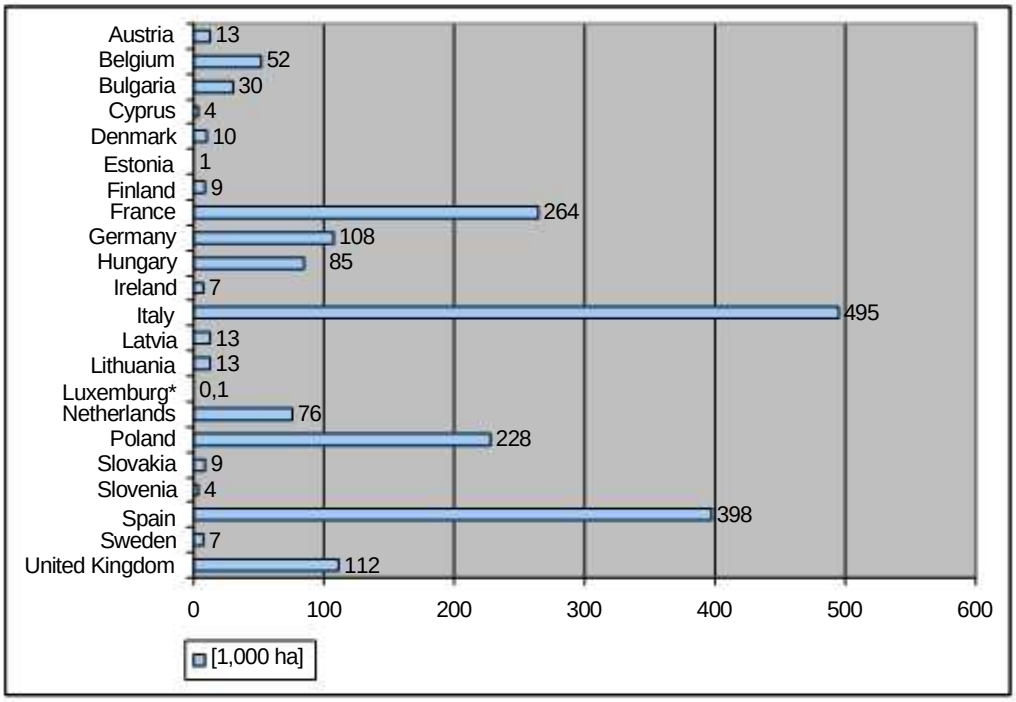
Figure 28: Number of vegetable holdings and fruit growing firms in the EU 15 (2003)

Table 17: Indicators for structural changes in the fruit and vegetable sector

	1990	2000
Number of vegetable holdings	298,730	212,300
Number of fruit holdings	691,700	537,700
Number of holdings growing vegetables and fruits	990,400	750,000
Average cultivation area for fruits	3.4 ha	3.9 ha
Average cultivation area for vegetables	16.5 ha	17.0 ha

Source: European Commission 2004b

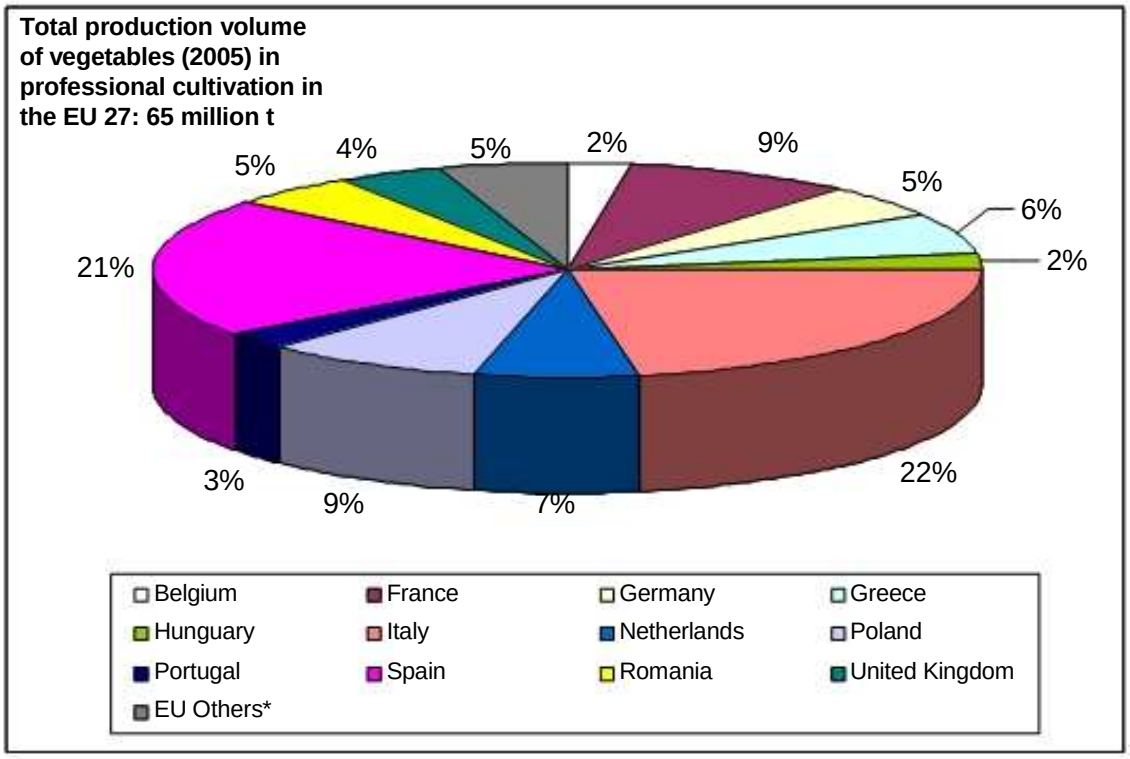
In 2005 the production of fresh vegetables in the EU occupied an area of at least 1,938,000 ha. Based on the available data, about 25% of the EU production area is located in Italy. Spain covers approximately 20%, France 13% and Poland 12%. Figure 29 presents the segmentation of the growing area in detail.



Data not found for Czech Republic, Greece, Malta, Portugal, Romania
Source: ZMP 2007a; *Luxemburg: ASTA

Figure 29: Production area of vegetables in professional cultivation in the EU 27 (2005)

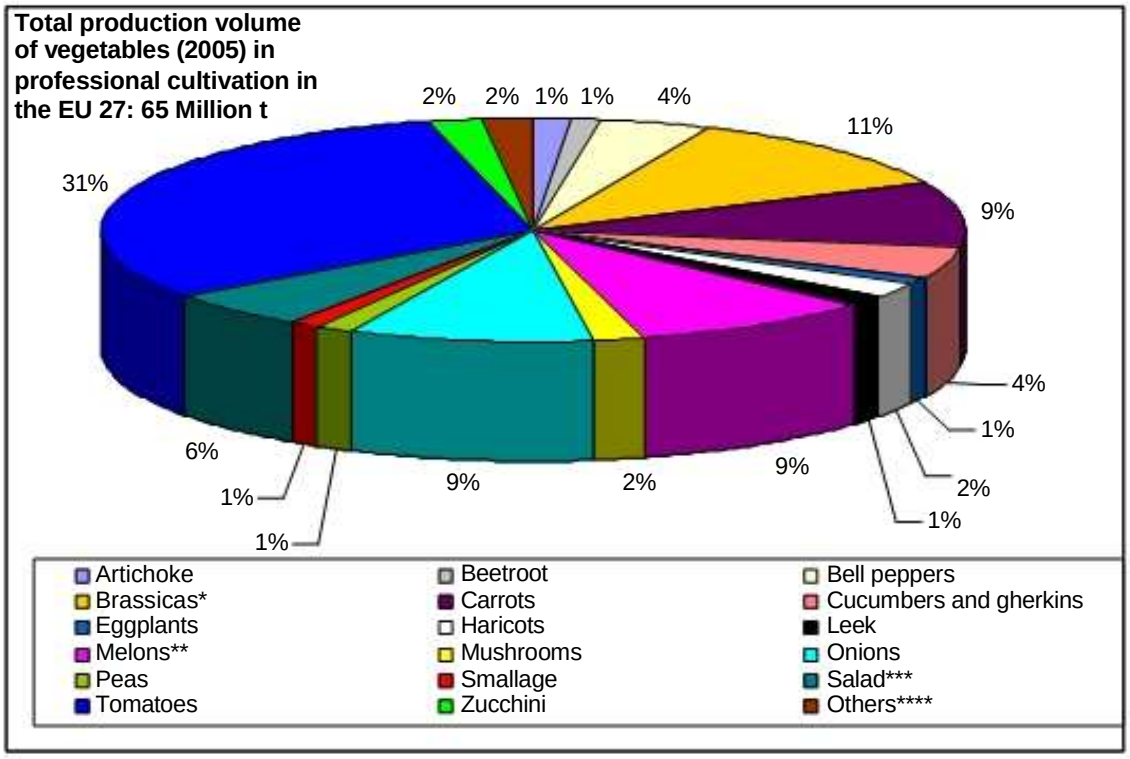
As shown in figure 30 the general annual production volume of vegetables amounted to approximately 65 million tons in 2005.



EU others*: Austria, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, Ireland, Latvia, Lithuania, Luxemburg, Malta, Slovakia, Slovenia, Sweden
Source: ZMP 2007a

Figure 30: Production volume of vegetables in professional cultivation in the EU 27 (countries 2005)

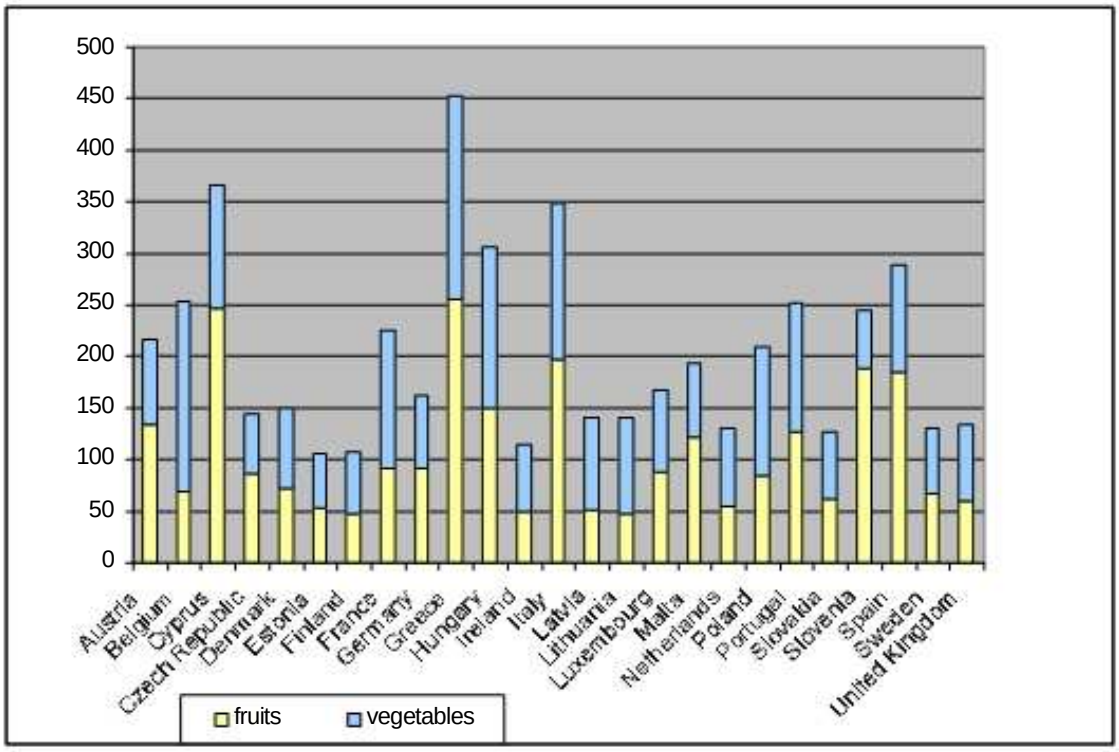
Main products are shown in figure 31.



Brassicas*: Brussels sprouts, Cauliflower, White cabbage
Melons**: Sugar melons, Water melons
Salad***: Lettuce, Endives
Others****: Asparagus, Spinach, Garlic
Source: ZMP 2007a

Figure 31: Production volume of vegetables in professional cultivation in the EU 27 (varieties 2005)

In 2001/02 the actual consumption of fresh fruit and vegetables in the EU was quantified as 43 million tons and 46 million tons respectively (European Commission 2003). National traditions and preferences lead to significant differences in consumption patterns for fresh vegetables and fruits in the EU 27 (figure 32).



Sources: Freshfel Europe 2006

Figure 32: Annual per capita consumption (kg) of fresh fruits and vegetables in the EU 25 in 2005

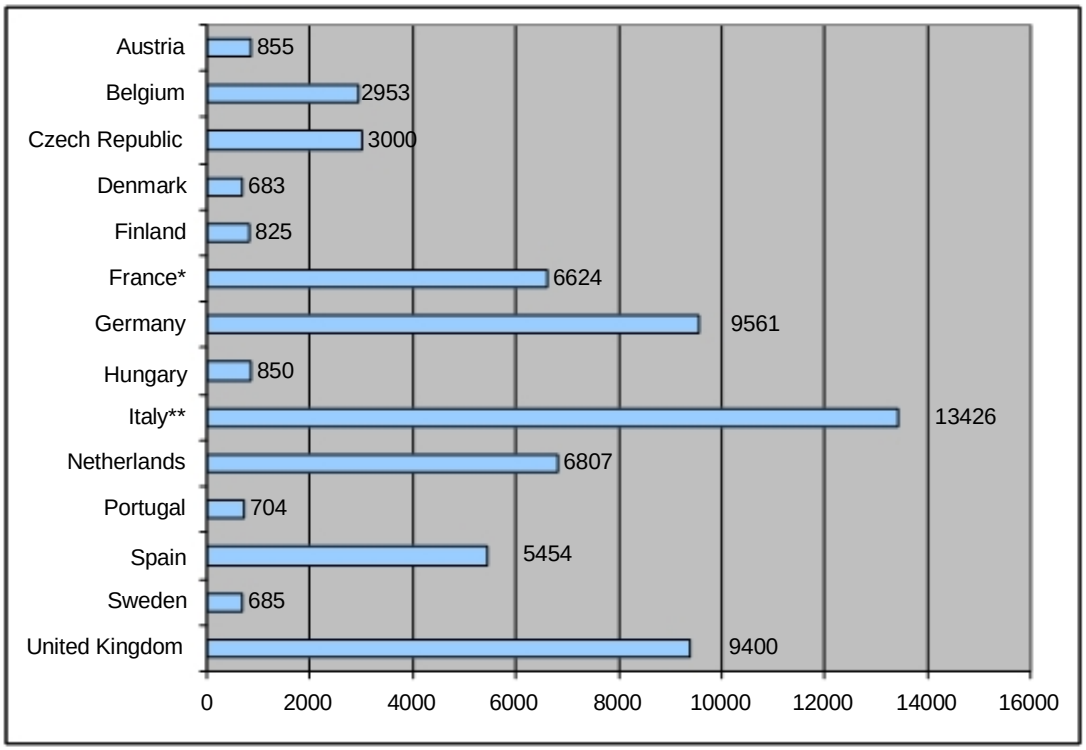
The international trade network is highly developed in the fruit and vegetable sector due to the need to supplement the product range available, thus taking advantage of best growing areas/climates and exchanging off-season products. The EU is the second largest exporter of fruits and vegetables and the world's leading importer. Nevertheless the EU is a net importer of fresh fruits and vegetables. Fruit and vegetables import trends all increased during the period 1999-2005 (European Commission 2006).

8.3.2 Ornamental plants and nursery stock

6% of the agricultural **production** value of the EU, and therefore less than the fruit and vegetable sector, is generated by the cultivation of ornamental plants and nursery products. Cultivation is characterised by the plurality of crops, including trees, bulbs, roots, tubers, cut flowers, foliage and pot plants. The sub-division is increasing in terms of size and value (European Commission 2003).

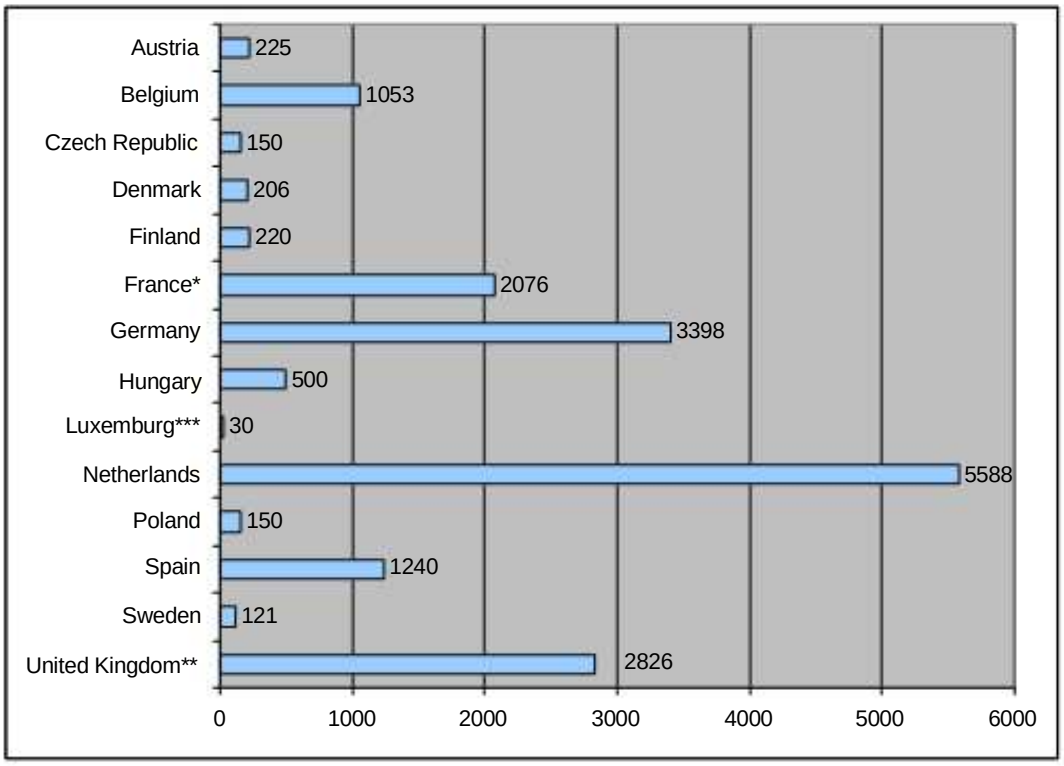
At least 61,827 firms in the EU are involved in growing ornamental plants (cut flowers and pot plants). According to available data 22% of the enterprises are located in Italy, 15% are in the United Kingdom and Germany. The number of nursery holdings is smaller, representing at least 17,783 companies in the EU 25. Based on available data the majority are situated in the Netherlands (31%), Germany (19%) and the United Kingdom (16%).

Figures 33 and 34 show the allocation of ornamental producers and nurseries in different member states.



Data not found for Cyprus, Estonia, Greece, Ireland, Latvia, Lithuania, Luxemburg, Malta, Poland, Slovakia and Slovenia,
Sources: AIPH 2007, France*: Office National interprofessionnel des fruits, des légumes, des vins et de l'horticulture ornamentale, Italy** : ISTAT 2005a

Figure 33: Number of holdings producing ornamental plants in the EU 25



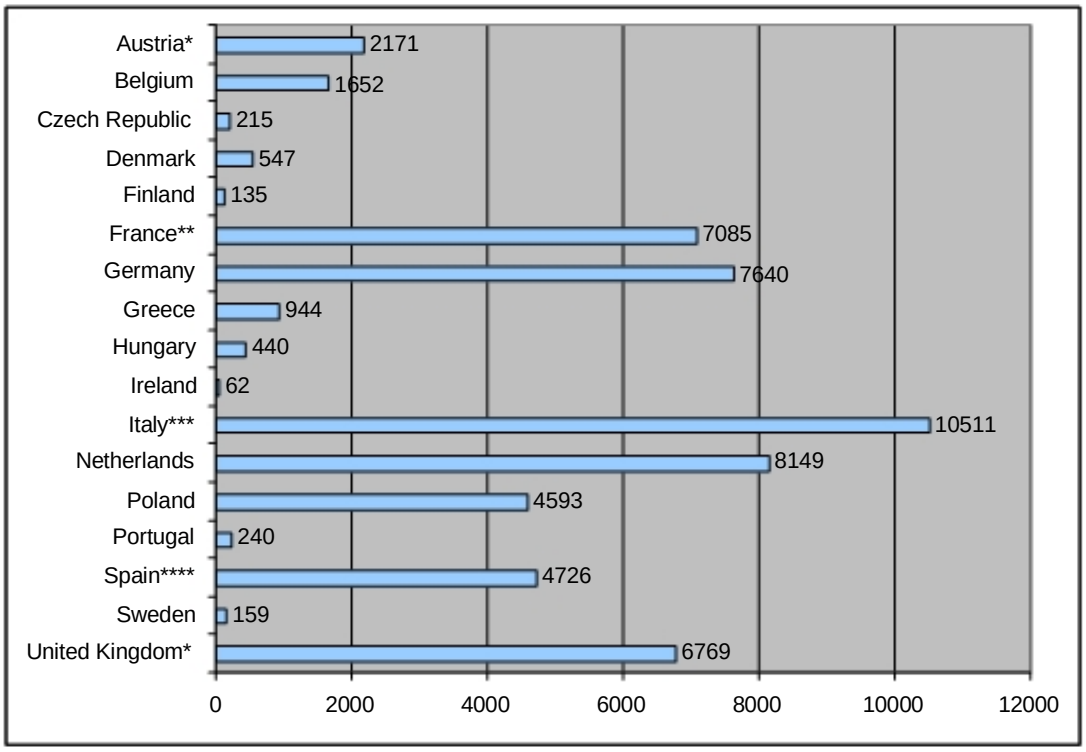
Data not found for Cyprus, Estonia, Greece, Ireland, Italy, Latvia, Lithuania, Malta, Portugal, Slovakia and Slovenia
Sources: AIPH 2007, France*: Office National interprofessionnel des fruits, des légumes, des vins et de l'horticulture ornamentale, United Kingdom**: Ministry of Agriculture, Luxemburg***: BMVEL

Figure 34: Number of nurseries in the EU 25

The production area for ornamental plants extends over at least 56,038 ha of land, partly under glass and other protective cover. The share of protected cultivation area varies from 69% in the Netherlands to 10% in France. Investment to create greenhouses is high due to technical and environmental standards for modern production.

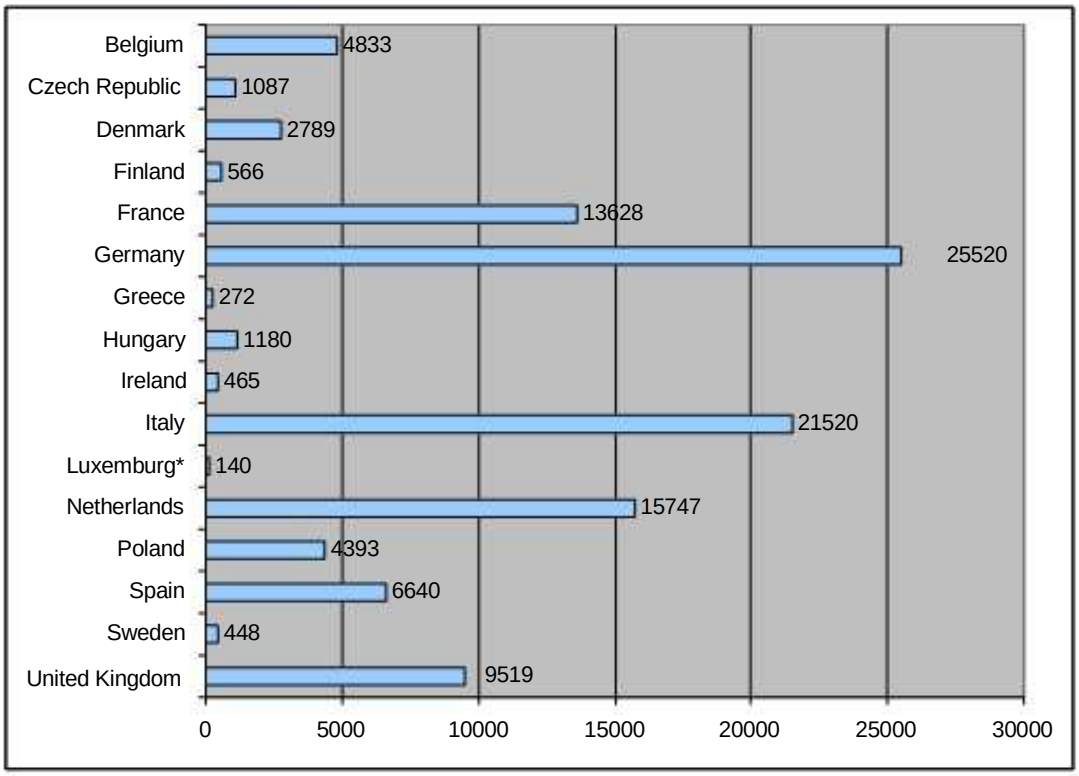
According to the available data Italy (18%), Netherlands (15%) and Germany (14%) are among the member states with the biggest total cultivation area (protected and in the open). Figure 35 shows the division of the growing area in EU member states.

Based on the available data Germany (23%), Italy (20%) and the Netherlands (14%) also occupy major parts of the 108,747 ha (minimum) production area for nurseries (figure 36).



Data not found for Cyprus, Estonia, Latvia, Lithuania, Luxemburg, Malta, Slovakia and Slovenia
Austria*; United Kingdom*: area of tree nursery included;
Sources: AIPH 2007, France ** Office National interprofessionnel des fruits, des légumes, des vins et de l'horticulture ornamentale, Italy ***: ISTAT, Spain ****: Ministerio de agricultura

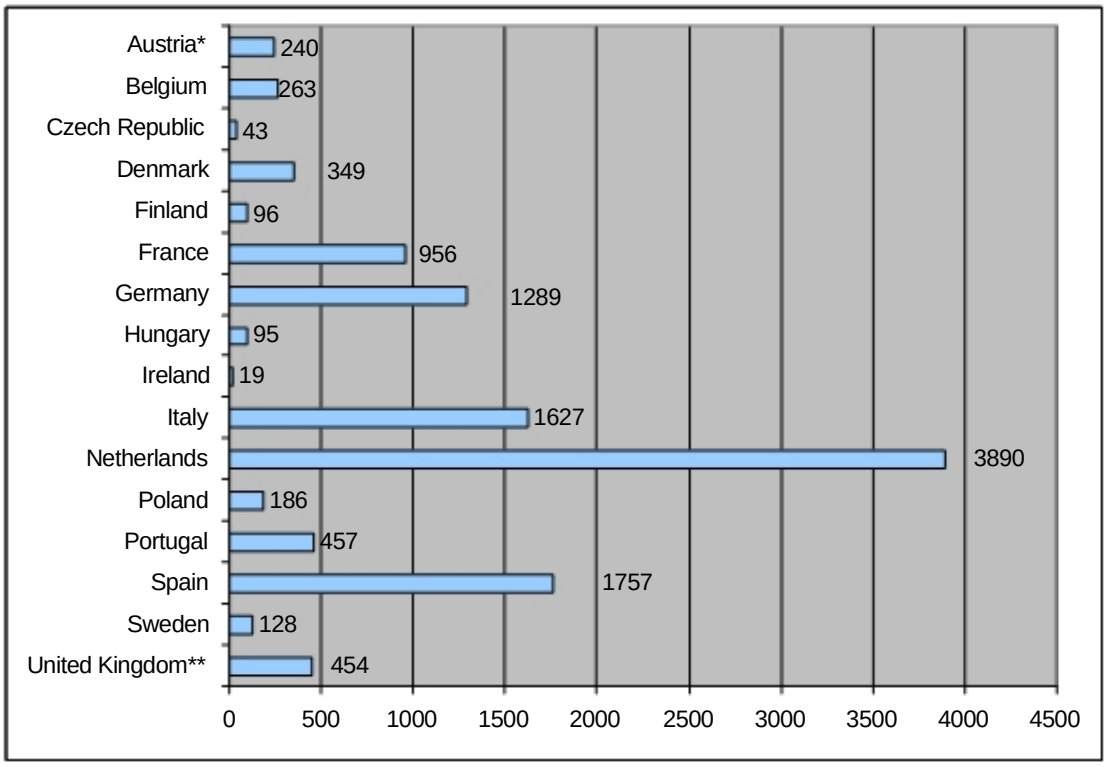
Figure 35: Cultivation area for ornamental plants (protected and in the open) in the EU 25



Data not found for Austria, Cyprus, Estonia, Latvia, Lithuania, Malta, Portugal, Slovakia and Slovenia
Source: AIPH 2007, Luxemburg*: BMVEL

Figure 36: Production area for nursery products in the EU 25

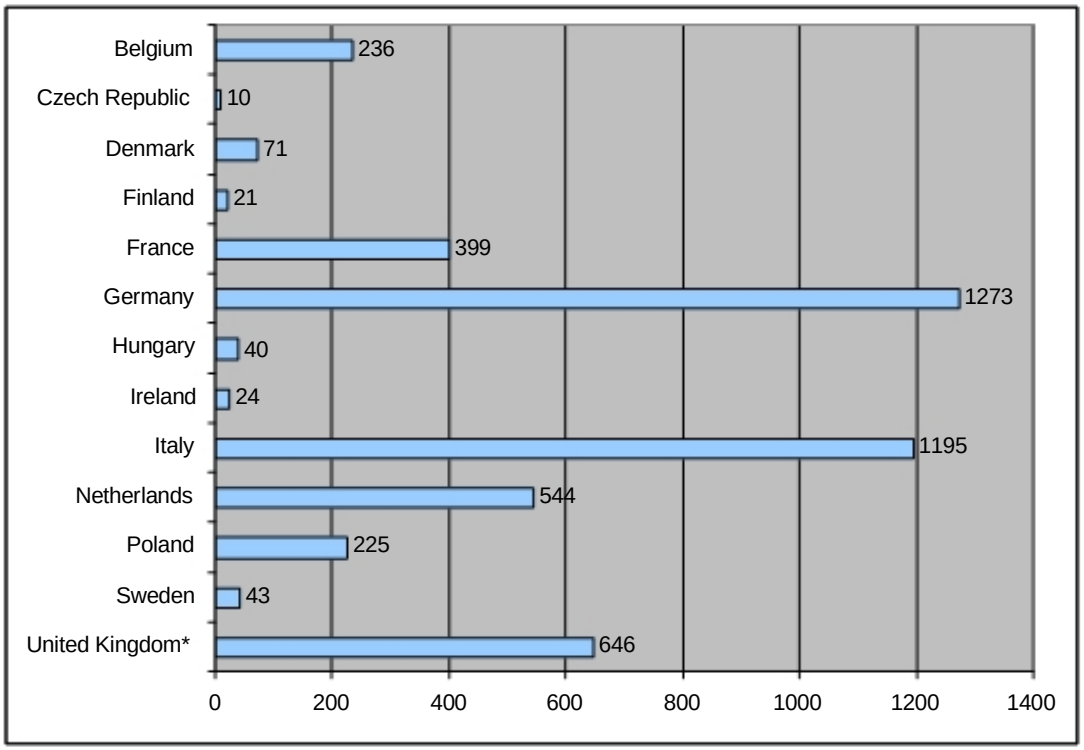
Production value for pot plants and cut flowers (excluding bulbs and tubers) totals at least 11,849 million €. Based on available data (figure 37) the Netherlands with 33% has the largest share by value, followed by Spain (15%) and Italy (14%). Ornamental production in these three member states is marked by high ratios of protected area (40-69%), which leads to the conclusion that intensity of flower and plant production depends on the possibility of regulating growing conditions. With regard to market trends experts emphasize the sales volume of orchids. Being a typical niche product, orchids have become the leading pot plants in Europe during the last 5-6 years.



Data not found for Cyprus, Estonia, Latvia, Lithuania, Luxemburg, Malta, Portugal, Slovakia and Slovenia
Austria*: tree nursery is included; United Kingdom**: Flower bulbs are included.
Source: AIPH 2007

Figure 37: Production value for ornamental plants in the EU 25

The total value of nursery crops amounts to at least €4.7 billion. According to available data Germany (27%), Italy (25%), United Kingdom (14%) and the Netherlands (12%) are the top producers in the EU. Figure 38 presents an overview of the different share by value. For the last decade experts have observed a slight over-production of nursery crops in Western Europe. Container production for nursery crops is increasing.

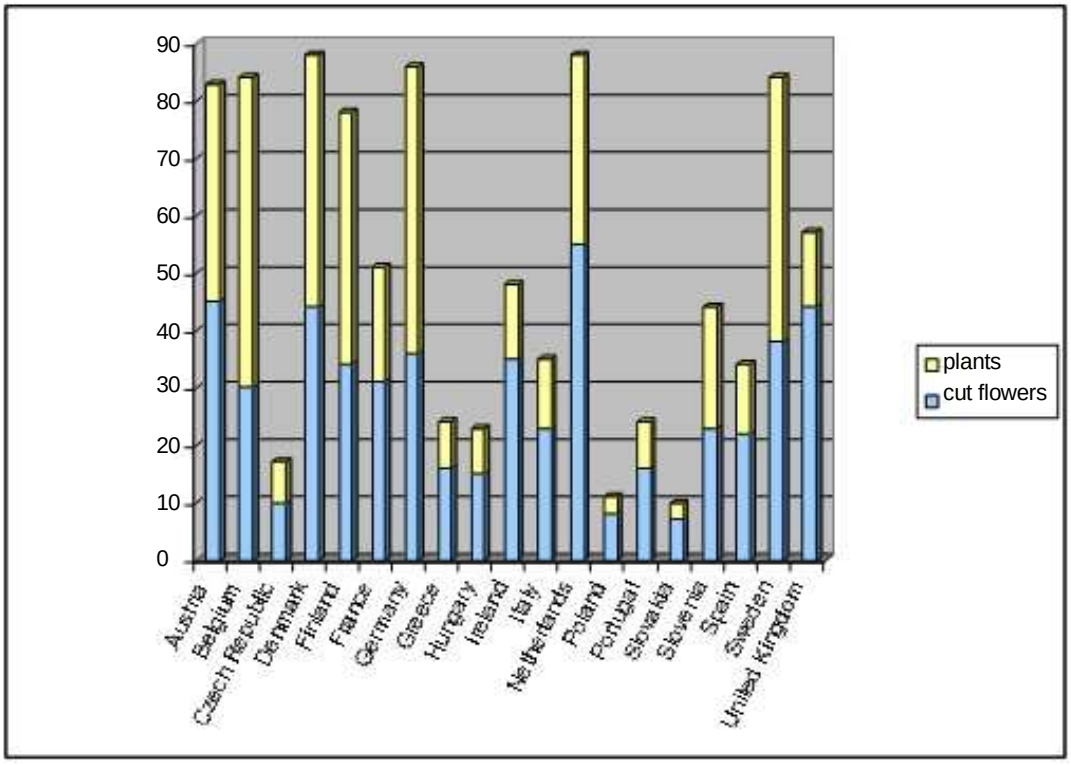


Data not found for Austria, Cyprus, Estonia, Greece, Latvia, Lithuania, Luxemburg, Malta, Portugal, Spain, Slovakia and Slovenia
Sources: AIPH 2007, United Kingdom*: Ministry of Agriculture

Figure 38: Production value for nursery crops in the EU 25

The EU market is not only one of the world's leading suppliers, it is also the centre of ornamental plant **consumption**. In 2004 the market value for cut flowers and pot plants was estimated at €23.1 billion. In the EU 27 (excluding Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Luxemburg, Malta and Romania). Germany (€7.1 billion), United Kingdom (€3.4 billion) and France (€3 billion) had the highest market values in the EU 27 (AIPH 2007).

Since ornamental plants can be regarded as non-essential, demand for them is generally directly linked to consumers' income. The comparison of per capita consumption in EU member states as given in figure 39 for 2004 underlines this observation. Whereas per capita consumption in Denmark, the Netherlands, Germany, Belgium and Austria exceeds €80 per year, per capita consumption in eastern member states, e.g. in the Czech Republic, Slovakia and Poland barely reached €20. The exception was Slovenia where the per capita consumption reached €44.



Data not found for Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Luxemburg, Malta and Romania
Source: AIPH 2007

Figure 39: Per capita consumption of ornamental plants in the EU 27

External trade for ornamental horticultural products (table 18) shows a widespread, branched network. In 2005 the EU 25 imported cut flowers and pot plants amounting to €6.1 billion. Approximately 58% of the import value pertains to fresh cut flowers. The EU 25 was also an important exporter for cut flowers and pot plants. Export activities totalled €6 billion derived approximately in equal measure from cut flowers and pot plants (AIPH 2007).

When considering European external trade of horticultural products, a high amount of re-export has to be taken into account.

With regard to cut flowers the intra-European imports are estimated as 76% in 2006 (provisional data). Major suppliers outside the EU are Kenya (41%), Columbia (15%), Ecuador (13%) and Israel (10%). Entrance states for extra-European cut flower

imports into the EU 25 are mostly the Netherlands (58%), the United Kingdom (20%) and Germany (7%).

Intra-European exports are estimated as 83% of all European exports in 2006 (provisional data). The Netherlands (91%) and Italy (3%) are leading export countries for cut flowers to states outside the EU. Russia (31%), Switzerland (22%) and the United States of America (19%) are major importers of cut flowers from the EU 25.

Table 18: Relations of external trade for ornamental horticultural products in the EU 25

	Import		Export	
Value EU 25 (2005)	6.1 billion €		6.0 billion €	
Proportion cut flowers	58%		50%	
Proportion intra European trade	76%		83%	
Suppliers and destinations for extra EU-trade	Kenya	41%	Russia	31%
	Columbia	15%	Switzerland	22%
	Ecuador	13%	USA	19%
	Israel	10%		
Entrance and departure points for extra EU-trade	Netherlands	58%	Netherlands	91%
	United Kingdom	20%	Italy	3%
	Germany	7%		

Source: AIPH 2007

In 2005 the import value of nursery stocks reached €650 million in the EU 25, whereas the export value amounted to €740 million.

Information about trade structures for nursery stocks (table 19) is given in combination with pot plants since many pot plants which are grown under glass in Europe are typical nursery products in the southern hemisphere. The term ornamental nursery products therefore implies pot plants and nursery stock.

The import value of ornamental nursery products is put provisionally as 3.2 billion € for the EU 25 in 2006. Intra-European trade represents approximately 92%. China (15%), Costa Rica (12%), Kenya (12%) and Israel (10%) are the most important

trade partners for ornamental nursery products. Entrance states for extra-European imports for ornamental nursery products into the EU 25 are mostly the Netherlands (62%), Italy (6%) and United Kingdom (4%).

In 2006 EU exported ornamental nursery products worth €3.6 billion of which approximately 85% remained in the EU area (provisional data). The Netherlands (54%), Italy (10%) and Belgium/Luxemburg (4%) contributed the largest share of exports to non-member states of the EU. Switzerland (32%), Russia (13%) and Norway (12%) were the major importers of ornamental nursery products from the EU 25.

Table 19: Relations of external trade for ornamental nursery products in the EU 25

	Import		Export	
Value EU 25 (2006 p.)	3.2 billion €		3.6 billion €	
Proportion intra European trade	92%		85%	
Suppliers and destinations for extra EU-trade	China	15%	Switzerland	32%
	Costa Rica	12%	Russia	13%
	Kenya	12%	Norway	12%
	Israel	10%		
Entrance and departure points for extra EU-trade	Nether-lands	62%	Netherlands	54%
	Italy	6%	Italy	10%
	United Kingdom	4%	Belgium/ Luxemburg	4%

Source: AIPH 2007

8.4 Summary

The horticultural sector in the EU is based on specialised, intensive cultivation of horticultural crops. It contributes an important share to European self-supply due to its products that complement agricultural food supply. Compared to main agricultural crops horticultural products are high in value.

The European horticultural market is a leading market worldwide both in terms of production and consumption. European vegetable growers produce 14% of the worldwide production volume of vegetables. Europe has attained a leading position for cut flowers and pot plants adding 46% to worldwide production value.
Modern horticulture is an international business; larger firms cultivate on different continents taking advantage of different climates, lower production costs and higher prices for off-season products. International trade links producers and consumers all over the world as well as horticultural companies and the supply industry, such as the growing media industry, greenhouse constructors or the fertilizer industry. Horticultural players interface with food retailers, processing companies, garden centres and professional florists.

The EU is the world's leading importer for fruits and vegetables on the one hand and cut flowers and pot plants on the other hand. Therefore the EU and its highly professional well established horticultural service providers constitute a major target market for third country exports.

Horticultural products belong to Europeans' every day life, either as staple foods or as an element of their culture and lifestyle.

9 The socio-economic impact of peat and growing media on horticulture in the EU

Previous chapters show that horticulture is a highly developed industry based on intensive production and with regard to cultivation in greenhouses, mostly computer controlled (chapters 6.1 and 8 of this report). Horticulture is directly linked to the food industry and retail sector. In contrast to other agricultural markets horticulture relies upon market demands: “There is no financial assistance to the flowers and plants sector. No aid to producers, no intervention, buying or other price support and no export subsides are made available.” “(EU) policy is (…) increasingly targeted to encourage producers to be market-orientated. Subsidising the withdrawal of products (fruit and vegetables) from the market is practised much less often than in the past (European Commission, 2003a).”

Not only is it used traditionally in the horticultural market, but it has been proven that there is no overall better or more appropriate growing medium constituent available than peat (Schmilewski 1996; chapter 5.4.2 of this report).
Peat is irreplaceable because its characteristics best fit most horticultural requirements, e.g. structural stability, high water holding capacity, high air capacity, easily adjustable, low pH, low salt and nutrient content, no pathogens, insects or pests, free from weed seeds.

Horticultural yields are particularly dependent on factors that make it possible to influence growth, such as light, water, temperature, soil or growing media etc. Therefore highest production volumes are achieved in areas with a high percentage of greenhouse districts (see chapter 8.3.1.2). Peat is one of the growing factors.

Wrongly composed growing media or use of alternatives less suitable than peat can restrict plant growth and even horticultural production. Utilizing inferior growing media therefore puts all other horticultural means of regulating growing factors, i.e. fertilizers, into question. There is no need to regulate fertilization, if the nutrient release pattern of a growing medium based on treated biowaste, for example, is unknown.

Three main consequences of using less controllable growing media have to be taken into consideration:

a) an increasing production risk
b) diminishing yields
c) a rise of inferior product quality

Disregarding the fact that these consequences contradict EU policy which aims “to encourage producers to improve (…) their product quality” (European Commission, 2003a), it weakens horticultural markets in certain ways:

The relationship between producers and retailers is close in modern markets. Strict contracts for production and delivery are common. Trade partners usually dismiss producers who cannot fulfil the contract or who do not deliver products on time. Quality management and regulations make it difficult to sell inferior quality product. There is hardly any use for inferior quality product, except perhaps in the food processing industry, where possible sales entail distinct profit cuts. Due to strong competition, rising production costs and decreasing product prices, horticultural enterprises are unable to cope with profit cuts or diminishing yields. Further consequences relating to the food industry, to retailers and the agro-supply industry are certain, however their extent cannot be forecast.

Since enormous efforts have been made to improve the quality of horticultural products and to meet consumer demands at a premium level, using low quality products in the cultivation process is not an option.

Each sector of the professional horticultural industry depends on the use of peat to a different extent. Production of young plants, ornamental horticulture, potted herbs and nursery crops in containers mainly depend on peat-based growing media.

Trials and production programmes of peat alternatives are numerous. With regard to the horticultural industry alternative growing media constituents are utilized whenever their characteristics better fit the specific requirements for example: bark-based

growing media for orchids, hydroponic systems in interior landscaping and soil-less cultivation of vegetables grown on perlite, vermiculite or mineral wool. In general peat-free media play a lesser role in Europe and are confined to enthusiasts rather than professionals.

Choosing not to use peat means resorting to substitutes which might either be alternative growing media constituents of organic origin, some of which (e.g. soil, leaf mould, composted materials) were used before peat was introduced into horticultural production, or inert constituents such as perlite, vermiculite or mineral wool. Either one requires an adjustment in production process causing considerable investments in know-how and cultivation equipment. Consequences of alternatives have to be taken into account, too. Consequences of less predictable media and their constituents are listed above. With regard to inert media their unsuitability in most applications, the high demand of energy during the production process and the missing possibilities of recycling should be mentioned. The production of 1 m^3 of mineral wool needs 100-150 kWh, the production of 1 m^3 vermiculite approximately 230 kWh (Isover, 2007; NABU, 2001).

Peat offers many significant valued benefits to horticultural production. Environmental concerns and restrictions to conserve remaining peatlands are respected by the industry as part of its goal of reducing negative environmental impacts. “Closed production systems”, integrated and organic production are significant attributes of modern horticulture. In the White Book on “An Energy Policy for the European Union” the Commission emphasises that in the energy policy of the European Community market integration, sustainable economic growth, job creation and the prosperity of its citizens have to be taken into account. There is no reason why these principles should not apply to horticultural concerns.

Data about the number of horticultural employees in the EU were not available. Since the production of ornamental plants relies heavily upon peat employment in this sector is examined: In 2005 40,981 people (corresponding approximately to 23,689 full-time jobs) were employed growing flowers and pot plants in Germany on an area of 7,640 ha (BMVEL 2007a/ AIPH 2007a). Extrapolating from the German average

labour force per area to the production area for ornamental plants in the EU (at least 56,038 ha), ornamental horticulture provides at least 173,718 full-time jobs. This number is a conservative estimate since a lower level of technology in new member states requires additional labour force. Most enterprises are family-owned businesses which provide income and employment for several family members. Abandonment of peat means a threat to as many as 61,827 mainly small and medium sized firms growing cut flowers and pot plants in the EU.

The same is true for 398,100 vegetable holdings using peat for the production of young plants, as soil improvement, as growing media or casing soil for mushrooms. Based on the German average labour force per ha of vegetable production (0.31), a minimum of 600,780 full-time jobs are created in vegetable cultivation in the EU. Besides a direct economic effect on vegetable firms, reducing peat leads to interruptions in vegetable supply in general and regional supply in particular. A shift of cultivation areas can be expected and might result in the decreasing influence of EU regulations on product quality. Janick (1997) states that globalization and the change in horticultural production could have a profound effect on associated suppliers such as the peat industry. Optimum growing environments and low labour costs in areas with a Mediterranean climate, as well as the export of horticultural know-how, has made greenhouse crop growing feasible in almost any part of the world. These developments have led to an increase in the use of modern production materials like fertilizers and growing media in such regions worldwide. Similar developments may also be observed in the newer EU member states.

To conclude: the horticultural industry provides numerous jobs and supports the European food supply with high quality products. Besides jobs in horticultural production, jobs in horticultural service trade as well as in the agro-supply industry are directly related to developments in the horticultural market. Horticulture is economically important in and for the EU, which is evident in external European trade activities, for example imports of flowers, pot plants and nursery stocks add up to €6.75 billion (see chapter 8.3.1.2) whereas exports total €6.74 billion. Ornamental horticulture meets consumer demand and provides flowers and plants as a basic element of European culture and tradition. A reduction in European horticultural

production means weakening self-supply, giving-up high quality standards (including environmental issues) and leaving market shares to third countries without being able to influence their production methods.

The number of full-time direct employees in extraction, manufacture and sales of horticultural peat in 16 states of the EU totals 10,716 (see chapter 7.3.11). In Germany alone approximately 120 companies produce and process peat and growing media. The wages and salaries of all personnel amount to 100 million € (Industrieverband Garten, personal communication 2007). Throughout the EU several hundred more companies are engaged in supplying peat and growing media to horticultural enterprises in the EU. Peat production takes place in regions lacking in infrastructure mostly in remote areas where there is a chronic shortage of jobs. New jobs are also provided in associated branches of the economy.

10 Environmental issues concerning the use of peat in horticulture and peat extraction

Mires and peatlands have certain values and functions. Depending on one's standpoint, the importance of these can differ considerably. Joosten and Clarke (2002) say that "solving conflicts between different uses of mires and peatlands (for example, between economic utilisation and environmental conservation) in a rational way presupposes an understanding of the various values at stake". They continue by elucidating *idealistic*, *naturalistic* and *preference* approaches when seeking the values and functions of mires and peatlands.

A number of authors give several reasons why peatlands and peat are considered important for different interest groups and stakeholders (Bather and Miller, 1991; Asplund, 1994; Hood, 1994; Asplund, 1994; O'Connor, 1994; Schmilewski, 1996):

- Wildlife - Peatlands are an integral part of the biosphere and support rare and specialized flora and fauna.
- Hydrological significance - Peatlands have a significant role in the regulation of fluctuation watertables.
- Carbon sinks - Peat is moderately rich in carbon and mires act as sinks for CO_2.
- Genetic resource - The preservation of gene pools is seen as important.
- Archival store - Through their pollen record, peatlands contain a complete vegetational and climatic history.
- Growing medium constituent - No other constituent combines as many favourable physical, chemical and biological properties and is more suitable for growing media.
- Energy and fuel source - In countries with abundant resources peat contributes to a more balanced energy mix.
- Agriculture - Being a political goal in the past, peatland drainage, peat extraction and peatland amelioration have resulted in vast arable peatlands throughout the EU.
- Forestry - Another common after-use of cutaway peatlands.
- Restoration of former peat extraction areas.

Today, climate change is one of the main public issues worldwide. Within environmental organizations such as the International Mire Conservation Group (IMCG) and the International Peat Society (IPS), but also within the peat and growing media industry the impact of peatland use for agriculture, forestry, horticulture and energy on the carbon cycle is being intensively discussed. Emission of carbon dioxide (CO_2) is not a new criterion for evaluating the use of peatlands, but has gained new recognition in the worldwide debate on climate change, in particular in regions with peat extraction.

A characteristic of peatlands is the ability of the vegetation growing on them to capture carbon from the atmosphere. Actively growing peatlands (mires) have a positive net carbon balance and act as effective carbon sinks. Disturbed peatlands may have a positive, neutral or negative carbon balance depending on the nature of the intervention involved (Robertson, 1994). Therefore, while a relatively small proportion of peatlands is being used to provide peat products, very much larger areas in a natural or semi-natural state actively recapture carbon released. Furthermore, peatlands are capable of being restored to active carbon sinks following the peat production phase (Robertson, 1994).

Bather and Miller (1991) acknowledge the fact that when peat is extracted and drained, it is a source of CO_2 as the organic matter oxidises. They continue by stating that the magnitude of production of carbon dioxide and methane (another and more potent greenhouse gas which is emitted from *active* peatlands = mires) from peatland is small and essentially trivial in comparison with those from fossil fuel resources such as coal and oil.

The list provided above shows that there are many stakeholders with subjective interest in peatlands and peat, from conservation to industrial use. It seems as though all of these interests are entitled to support as well as criticism and that balance between them in the interest of all is needed.

From a horticultural point of view, peat and the peat and growing media industry are needed as long as horticulture depends on peat-based products in order to sustain major segments within the European horticulture industry.

10.1 Other materials than peat (peat alternatives)

The collected data show that peat, in particular *Sphagnum* peat, is the main growing medium constituent used for the production of professional and hobby market growing media. More that 37 million m³ of growing media are produced annually by hundreds of small to medium-sized companies in the EU. All growing media producers must aim for low cost production of risk free and quality assured media.

The first container media in which plants were grown were mainly composed of soil ex situ followed by mixtures of different soils, soils with organic matter, soil mixtures with peat and, in the 1950's, pure peat-based growing media (Schmilewski, 2000; Waller, 2006). This basic concept of industrially produced growing media, in principle also adopted by growers who make their own mixes, has helped make major segments of today's horticulture sustainable.

Although, Schmilewski (1996) concludes that no other growing medium constituent combines as many favourable physical, chemical and biological properties as peat does, another reason for admixing other materials to peat is simply to improve these properties and fine-tune them with any of the countless additives available on the market, i.e. fertilizers, liming materials, biocontrol agents, etc.

Waller (2006) gives further reasons for peat replacement other than enhanced plant performance and cost-effectiveness. "These include a desire to:

- conserve peat and 'rare' peatlands and protect biodiversity ▪ develop a 'sustainable' growing media industry
- promote the development of the composting industry and so recover and utilise more organic wastes

- use indigenous (waste) materials which are cheaper and/or make less environmental impact from transportation - especially in countries where peat is not harvested
- provide growing media more acceptable to a marketplace"

Developments such as the green movement which began in Germany in the 1970's, the overall need to reduce, recycle and reuse materials in all stages of daily life or the Peatering Out™ (English Nature & RSPB, 2002) drive in the UK are trends which imply the search for peat alternatives.

Weakly to moderately decomposed peat, considered by some as a waste material itself until the 1940's, because it covered the underlying strongly decomposed peat which was highly esteemed as an energy source in various European countries, has today reached an unmatched position in horticultural crop production. Meanwhile, the same has become true for (frozen) strongly decomposed peat which is used in specific fields of application (e.g. as a blocking substrate) and as a substitute for less decomposed peat (Fikuart, 1979; Schmilewski, 1999).

Long before the Peatering Out™ issue in the UK and supported by the concept of reducing, recycling and reusing biodegradable wastes, initiatives were taken by the composting and growing media industry and many research institutes throughout Europe to explore the possibilities of replacing peat by other materials. Alternatives to peat are generally of organic origin. The purpose of blending in mineral materials like perlite, vermiculite or clay is principally not peat replacement, but to improve the physical or chemical characteristics of the medium.

A great number of materials have been discussed by Bragg (1990), Pryce (1991) and many other authors before and after the above mentioned publications. Such materials include

- animal manure
- granulated bark
- cocoa shells

- coir
- composted bark
- food processing wastes
- garden compost
- grain waste
- ground straw
- leaf mould
- lignite
- paper sludge
- refuse derived humus
- rice hulls
- spent hops
- spent mushroom compost
- seaweed-based products
- sewage sludge
- straw-based composts
- tobacco wastes
- vermicompost
- woodfibre
- wood shavings

and have been discussed in the past by Bragg (1990), Pryce (1991) and many other experts. Meanwhile, all of these materials have been tested and trialled and some are being used as growing medium constituents and some as soil improver constituents. On a large scale and for industrial, quality assured production of growing media, only few have reached a significant level of application. Less favourable materials might be used because they are locally available.

Based on recently collected data for the year 2005, Schmilewski (2008) suggests 4 different categories of growing medium constituents:

- peat (bog peat and fen peat)
- other organics (bark, coir, wood fibres, wood chips, rice hulls, etc.)
- composted materials (green waste, bark, wood waste, etc.)
- mineral materials (perlite, clay, vermiculite, sand, pumice, mineral wool, etc.)

Figure 40 clearly shows the predominance of peat as a constituent of growing media in the EU. The data are based on data collected from 13 producer countries and show that 77.4% of all growing medium constituents is peat, 5.1% other organic materials, 9.1% composted materials and 8.4% inorganic materials. Schmilewski points out that 83% of all used composted materials are used for the production of hobby media. The difference in the total amount of peat used for the production of growing media 29.3 versus 26.8 million (figure 40) and the resulting percentages in relation to materials other than peat used in growing media production result from data reported from different sources, differently formulated questions and the number of countries that were surveyed (16 versus 13).

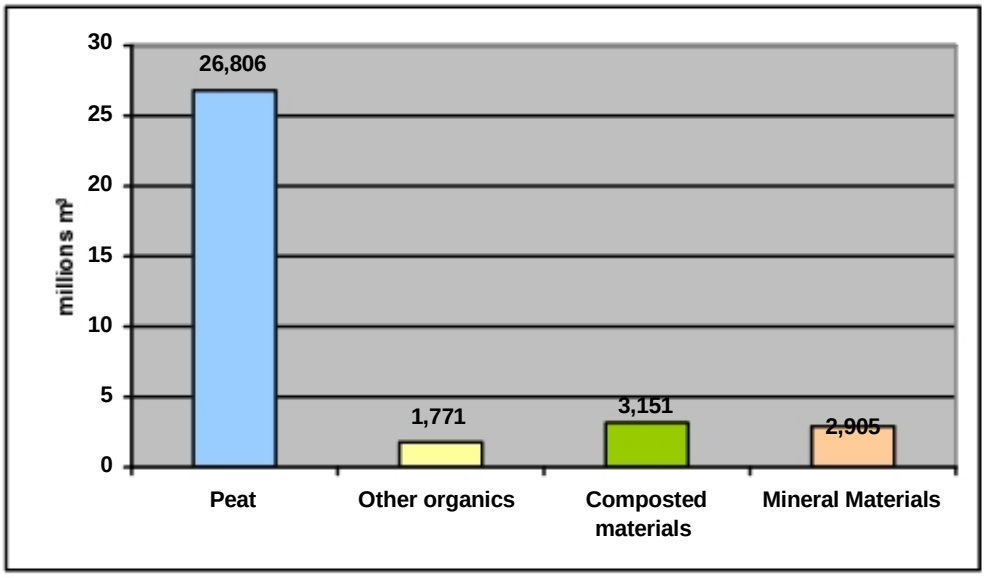


Figure 40: Total quantity (m^3 acc. to EN 12580) of different types of constituents used in the major producer countries for manufacturing growing media for the professional and hobby markets. Total production (year 2005) in these 13 countries was over 34.6 million m^3 (Schmilewski, 2008).

10.1.1 Peat-free growing media

Peat-free growing media are defined as media that do not contain any peat. Peatfree media are extremely popular with some stakeholders, calling for a halt to peat use. However, the quality of a medium is of utmost importance to the producer of growing media, the grower and even the layman.

It is known that most materials other than peat often have inferior properties. The supplier or producer of growing media is liable for any plant or other consequential damages resulting from faulty growing media. His success and reputation are constantly at stake. These are the reasons why the amount of peat-free growing media in the EU is insignificant, accounting for 3.7% of all growing media produced in the 13 EU member states reported on (Schmilewski, 2008).

10.2 Legislation on peat extraction in the EU

Peat extraction in the EU is clearly regulated by European and national legislation. EU regulations include:

- Council Directive 85/337/EEC of 27th June 1985 "On the assessment of the effects of certain public and private projects on the environment (*Environmental Impact Assessment (= EIA) Directive*), as amended by Council Directive 97/11/EC of 3rd March 1997 (same title)
- Council Directive 92/43/EC of 21st May 1992 "On the conservation of natural habitats and of wild fauna and flora" (*Habitats Directive*)
- Council Directive 79/409/EEC of 2nd April 1979 "On the conservation of wild birds" (*Birds Directive*)

The *EIA Directive* aims to ensure that before a decision is made about whether to allow a development (peat extraction) to proceed, the authority making the decision has a minimum amount of information about the environmental effects of the project.

Today, the 1997 amendment requires an environmental impact assessment in all cases of peat extraction where the site exceeds 150 hectares.

The *Habitats Directive* deals with the obligations of member states to list and designate sites to be included in a European network of special areas of conservation to be known as Natura 2000. The aim is to maintain or restore the natural habitats and the populations of wild flora and fauna in EU member states.

The *Birds Directive* relates to the conservation of all species of naturally occurring wild birds in the EU Community. The Directive obliges member states to take requisite measures to establish a general system of protection for all species of naturally occurring wild birds.

These and other European as well as national regulations and their implementation in the EU member states are dealt with in depth in a second EPAGMA study entitled *"Legislation and permit policies regulating the use of horticultural and energy peat resources and peat-based products in the EU*", which has also been published in 2008.

10.3 After-use of former peatfields

In the past centuries it was the aim of European governments to develop mires into arable land for settlement. In some countries after-use for forestry still has priority. At the time of bog and fen development mire conservation was not an issue (ZIT, 1990). These are the main reasons why pristine mires are so rare in the EU member states of today.

Today one of the main objectives of after-use of extracted peatlands, e.g. in Germany, is restoration, i.e. rewetting and re-growth of typical bog vegetation. In some EU member states (e.g. Finland) agriculture or forestry is the predominant way of after-use. The process of bog restoration is complex and requires time. Farell (2006) concludes that peatland restoration is a developing discipline and the general principles can be applied to any area where a peat layer remains. It is important to

determine the appropriate method to restore peat-forming conditions and whether this is a realistic and attainable goal. Money (2004) notes that factors such as residual peat depth, peat types, landscape situation and cutting method have the potential to generate many different starting points for peatland restoration.

Figure 41: A rewetted peat field after extraction.

For Germany, a leading country in bog restoration, Blankenburg (2006) reports that since the 1970's up to now 12,000 ha of raised bogs have been rewetted in Lower Saxony, the Federal State where 90% of all German peat is extracted. Currently, peatland restoration is advancing in all EU member states with peat extraction. Once restored, these areas will again contribute to a more positive CO_2 balance as carbon sinks.

11 Conclusions

There is an ongoing debate between environmental organisations and the peat and growing media industry regarding the extraction and usage of peat. Growers, end users and the public have also entered the debate in search of factual information. EPAGMA, as the representative of the peat and growing media industry, has commissioned two studies to discuss the position of the peat industry. This study report concentrates on *"The socio-economic impact of the peat and growing media industry on horticulture in the EU";* the other study reflects the *"Legislation and permit policies relating to the use of horticultural and energy peat resources and peat-based products in the EU"*.

As the report about peat legislation (also published in 2008) shows in detail, there is a clear and strict legal basis for peat production. Peat production is strictly regulated in all EU member states and regulations allow for the conservation of peatlands and mires as well as the environmental impact of peat production.

Data about the production and usage of peat in Europe present reliable facts and figures about this natural resource. The annual demand totals 69.3 million m^3 (chapter 7.3.5). Over 50% of this amount results from the use of peat as a fuel/energy source. Approximately 42% of peat is used for the production of growing media. To date, due to the specific combination of positive characteristics (chapter 5.4.1), a general substitute for peat in the horticultural industry is not possible. The peat and growing media industry is strongly linked to horticulture. However, it should be noted that horticultural sub-divisions rely upon peat to different extents (chapter 7.4.1). In areas where peat characteristics do not meet specific horticultural requirements other growing medium constituents are used.

Numerous research projects and field trials have been carried out in order to find a suitable substitute for peat as a growing medium. In particular the Netherlands, which depends totally on peat imports and acts as a leading horticultural producer and trade partner in the EU, is making profound efforts to find alternative growing media. Due to chemical disadvantages in raw material, such as ongoing decomposition of

the medium in the container or unfavourable water and air capacity, a real peat alternative still has to be found. There are some inert materials in use, e.g. vermiculite and perlite; however, their extensive production process and missing recycling opportunities limit their distribution. A peat-based growing medium can always be recycled as a soil improver at the end of its life. Mineral wool slabs are quite commonly used in specific growing systems, but cannot be applied to pot or container growing systems.

Further research programmes should concentrate on growing media with peat-like characteristics and should be supported by various groups of stakeholders such as horticulturalists, scientists, members of the growing media industry and environmental organisations. Even at this point in the research it becomes obvious that a basic change in horticulture will be successful only if the characteristics, availability and costs of the alternative media are convincing.

The EU market for horticultural products is highly developed with regard to technical standards and growing methods including environmental issues, food safety and quality aspects. International quality systems have been developed and implemented through European ambitions. Therefore, the European market for horticultural products can be considered as the leading market worldwide.

Horticultural products have a significant share of value compared to agricultural crops. The creation of economic value is a central characteristic of the European horticulture sector and approximately 17% of the value of agricultural production results from growing fruit and vegetables whereas only 4% of the agricultural land is covered with production areas for fruit or vegetables.

Besides horticultural production the EU market is based on a solid and growing demand which is particularly increasing in the new member states, since the demand for horticultural products correlates with rising incomes.

EU policy sets the framework for fruit and vegetable production mainly with the common market organisation, and for quality standards for ornamental plants, cut

flowers and trees. EU policy is based on four overriding aspects: the diversity of horticultural products, their perishable nature, efforts to improve product quality and the importance of trade. “EU policy is aimed at encouraging growers - whether of fruit, nuts or flowers - to improve both their product quality and their marketing” (EU Commission, 2003). It supports producer organisations in order to “ensure that production is planned and adjusted to demand…” (EC No 1182/2007). Production close to the market and self-supply have always been in the interests of both consumers and politics. There are also programs by the EU, such as “5 a day”, meant to increase the consumption of fruit and vegetable as a means to a healthy lifestyle. These programmes aim first at consumption; as a side effect the demand for fruit and vegetables stimulates production.

Therefore, cutting back horticultural production by restricting the use of peat would be counterproductive to former and present EU policy. Furthermore, the effect of protecting peatlands appears to be questionable since the existing demand for horticultural products will lead to a dislocation of production. In consequence besides a loss of jobs the EU would become more dependent on imports and have less influence on production and quality aspects.

The argument applies to peat production itself. Since horticultural production creates a real demand for peat-based growing media the industry would have to import peat if European peat production were restricted. Russia and Canada might take up the role of main peat suppliers but at much higher logistical costs. Distortion of competition as a consequence contradicts European trade policy. There are critical considerations about peat production to be addressed. However, limiting peat production without limiting demand simply means a shift to an area of lower influence. Production would increase in states outside the EU where the environmental policy of the EU does not apply.

According to a social but free market economy, policy has a role in ensuring market freedom, providing a general framework for economic exchange and ensuring social needs. The EU has developed and implemented different programmes, such as LEADER and ELER, in order to stimulate rural development, improve quality of life in

rural areas and provide new jobs. The peat and growing media industry is able to support these aims since peat production requires manpower and usually takes place in remote areas.

Three major options could be envisaged for peat and growing media harvesting without limiting European peat or horticultural production:

- To reduce the use of peat in those areas where substitutes are available (e.g. peat as a soil improver).
- To encourage further research and field trials in order to develop growing media with peat-like characteristics or to be able to grow “peat substitutes” by *Sphagnum* farming.
- To implement the guidelines for a “wise use of mires and peatlands” and to stimulate after-use restoration of production areas. As set out in these guidelines the growing media industry agrees that “it is wise not to use the resource to the point of exhaustion” and expresses interest in sustainable peat management.

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Appendix

Appendix A:

Notes on completing the questionnaire

Table A shows the questionnaire which was sent out to the country coordinators and which the coordinators then passed on to individual collators as needed. For better comprehension and to avoid misunderstandings and misinterpretation which obviously would have had an impact on the completion of the form sheet by individual country experts, PWC, together with EPAGMA experts, defined specific terms related to peat and growing media production as well as to the different horticultural segments. The detailed set of notes, definitions and specific terms produced accompanied the questionnaire. The individual country coordinators and data collators were asked to read these notes and definitions very carefully before completing the questionnaire. In general the definitions contain the basic information given in the more detailed explanatory definitions in chapter 6 of this report.

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Table A

Peat Production and Consumption Volumes, Imports and Peat Product Manufacture, Sales and Experts
(Please read the Notes on completion of this questionnaire carefully before starting to complete it - and when completed return the country consolidation to Paul Waller at p.waller@ntlworld.com)

A

Country:	
Year:	e.g. 2004-5, 2005 or 2005-6

B

National Peat Production over last five years		
	Year:	000's m³ peat
Year 1		
Year 2		
Year 3		
Year 4		
Year 5		
Average (calculated)		0
OR Average of last five years (estimated)		

C

Raw Peat Consumption	000's m³ peat	%
Domestic sources		#DIV/0!
Imported sources		#DIV/0!
Total raw peat use	0	#DIV/0!

D

Imported finished products containing peat for domestic consumption		000's m³		Average % peat	0	000's m³ peat

E

	Growing Media		Soil Improvers			Energy			Uses other than Hort. or Energy			ALL USES
Manufacture	000's m³ peat	000's m³ non-peat	Manufacture	000's m³ peat	000's m³ non-pea	Manufacture	000's m³ peat	m³ peat per MT	Manufacture	000's m³ peat		000's m³ peat
Floriculture									Specialty			
Hardy nursery stock												
Vegetable growing												
Fruit growing												
Cooled Soil (Mushrooms)												
Other												
All Professional Horticulture Market	0	0	Professional market									
All Hobby/retail use			Hobby/retail market			Fuel peat						
TOTAL Volume	0	0	TOTAL	0	0	TOTAL	0		TOTAL	0		0
TOTAL peat and non-peat volume	0			0			0			0		

F

	Growing Media		Soil Improvers			Energy			Uses other than Hort. or Energy			ALL USES
Sales	000's m³ product	Euro/m3 ex works	Sales	000's m³ product	Euro/m3 ex works	Sales	000's m³ product	Euro/m3 ex works	Sales	000's m³ product	Euro/m3 ex works	000's m³ peat
Home market			Home market			Home market			Home market			
EU Exports			EU Exports			EU Exports			EU Exports			
Non-EU Exports			Non-EU Exports			Non-EU Exports			Non-EU Exports			
TOTAL / MEAN	0	#DIV/0!	TOTAL	0	#DIV/0!	TOTAL	0	#DIV/0!	TOTAL	0	#DIV/0!	
Check sums (= 0)	0			0			0			0		0

G

Full time direct employees in extraction, manufacture and sales of horticultural peat products only	

General

- Only one excel spreadsheet per country shall be returned to Paul Waller Consulting by the national co-ordinator.
- All data will be treated in strict confidence.
- Neither Paul Waller, nor any other person assisting with the consolidation or interpretation of the EPAGMA survey shall see the individual company returns making up each national return which is completed by the appointed independent national co-ordinator. [The only exception is in the UK where Paul Waller will himself prepare the UK return. However, no individual UK company data will be shared with anyone else.]
- With the exception of national peat production/harvesting data which relates to a five year period, the other data should refer to a named 12-month production period (section A). This should be the same period for all product-related data.
- Only boxes coloured blue are to be filled in. Grey boxes in the spreadsheet will be completed automatically based on results supplied in the blue boxes.
- If completed correctly and logically the check sum values in row 45 should add up to zero when the total sales of peat products domestically plus exports (section F) are equal to the volume of these products produced (section E) in the country. Likewise the total volume of peat used to manufacture peat-based products (section E, box N35) should equal the total volume of domestic and imported peat consumed for all purposes (section C, box C21).
- In all cases where hard data is not available, respondents are asked to provide an informed 'industry estimate' and to indicate that the figure is an estimate only.
- It is recognised that fuel peat is usually quantified in tons, but it is requested that for consistency with other data throughout, the fuel peat contribution is always converted to cubic metres and the conversion factor used (that is, cubic metres per ton) is entered into box J34

Section A - Country and Year

- Enter the country name and specify the year to which the consumption, manufacturing and sales data apply. It is suggested that the datum period is the calendar year 2005 but a similar 12-month period (say July-June) would be acceptable.

Section B - National Peat Production

Peat production is defined as the actual amount of peat that was harvested (produced) and put into stockpiles at production sites in the country in the given period and quoted in cubic metres (EN 12580) not tons.

- It is recognised that peat production varies from year to year (principally

Section C - Raw Peat Consumption

In the context of this survey peat consumption is defined as the total amount of domestic and imported raw peat that was used in the manufacture and sale of peat (and products containing peat) for all uses (at home and abroad) in a given period and quoted in cubic metres (EN 12580) not tons.

- The figures for domestic and imported peat should be entered into boxes C19 and C20 respectively.

Section D - Imported Finished Products Containing Peat for Domestic Consumption

Imported products containing peat for domestic consumption means any peatcontaining product that is imported for sale/use in the country in a given period and quoted in cubic metres (EN 12580) not tons.
Note: This includes not only value-added products such as growing media, but also simple peat products without additives such as soil improvers.

- This will be the major category for any country without indigenous peat reserves or a significant peat product manufacturing industry. Countries with their own peat product production are, of course, asked to fill in this section as well, if appropriate.
- Please enter the total volume of the products (not just the peat portion) in box C23
- Please estimate the average peat content of these imports in box E23 to enable the volume of peat to be calculated.

Section E - Manufacturing

In this context this means the volume for various peat and peat-containing products produced within a country from imported and domestic peat sources for use within the country or exported in a given period and quoted in cubic metres (EN 12580) not tons.

The following additional category definitions are relevant:

Growing Media (CEN definition): *Material other than soil in situ in which plants are grown* (usually in containers)
Note: Include fertilized planting media that may be used to plant trees and shrubs which are often put into planting holes in natural soil or planting media which are applied to natural soil as a supplementary surface layer and act as a the primary rooting medium. Also, for the purpose of this study, 'Casing soil' for mushrooms is considered a growing medium too.

Soil Improver (CEN definition): *Material added to soil in situ primarily to maintain or*

***Energy**: The use of peat as a fuel.*
Note: Whilst fuel peat is usually quantified in tons, it is requested that for consistency with other data throughout, the fuel peat contribution is always converted to cubic metres and the conversion factor used (that is, cubic metres per ton) is entered into box J34

***Agriculture:** Concerned with the large-scale production of food and fodder crops in field soil*

***Horticulture:** Concerned with the raising and production of ornamental crops for use in the home, gardens and amenity plantings - often under protection; also the intensive raising and production of food crops under protection.*

***Uses other than Horticulture or Energy**: Uses of peat not described above, for example, in filters, for the production of activated carbon, as animal bedding, as an agricultural soil improver, a constituent of artificial topsoils, in whisky making or in balneology.*
Note: Please ensure it is the volume of the peat input which is quoted and not the amount of end product.

In professional horticulture the various categories of use are defined as follows:

***Floriculture**: The production of tender ornamental flowering or foliage crops for cutting or grown in pots or containers as houseplants or as garden (bedding or patio) plants - includes propagation of such plants.*

***Hardy Nursery Stock**: The production of hardy ornamental and woody perennial plants in pots and containers - includes propagation of such plants.*

***Vegetable Growing**: The propagation of young plants of edible leafy and other vegetable crops in blocks (pressed pots), multi-cellular trays or other modules for later transplanting into soil or other growing systems. Also includes the production of other edible glasshouse vegetable crops such as tomato, pepper and cucumber.*

***Fruit growing**: The production of soft fruit in pots or containers, such as strawberries*

***Casing Soil (Mushrooms):** The capping layer applied to mushroom substrate to promote fruiting body (mushroom) development*

***Other**: Any other professional growing media use not covered by the five categories above.*

- Alternatively, if no reliable quantified information is available on the division of professional use between the previously named categories, composite figures

***Hobby/Retail Horticulture**: Horticulture for pleasure, not profit.* ▪

Please enter details in the relevant boxes.

Section F - Sales

This seeks to gain information on the degree to which home produced peat products are sold at home and abroad and to quantify the average ex works selling price in Euros per cubic metre. Based on this information it will be possible to estimate the value of the market for peat-based products within the EU (excluding transport). The selling prices are not those paid by the retail consumer.

The check sums assume that all that is produced (in Section E) is sold in the period with no significant impact from any change to inventory.

Section G - Full time direct employees in extraction, manufacture and sales of horticultural peat products only

This section seeks an estimate of the number of full time employees involved in the production, processing, development, marketing and sales of peat and peat-based horticultural products in the country. Transport is excluded as most of this work is contracted.

- Include administrative staff.
- Part time employees should be included as full time equivalents (fte), so two part-timers working six months per year count as one fte.
- If a company is also involved with products other than peat (such as fertilizers or pesticides) please include only that proportion of the personnel who are actively dealing with peat matters.

Enter the figure in box H48.