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THE ECONOMIC IMPACT OF ORNAMENTAL HORTICULTURE AND LANDSCAPING IN THE UK

REPORT FOR THE ORNAMENTAL HORTICULTURE ROUNDTABLE GROUP

SEPTEMBER 2018

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September 2018

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KEY FINDINGS

- **Ornamental horticulture and landscaping in the UK made an estimated £24.2 billion contribution to national GDP in 2017.** This impact was driven by the horticulture industries themselves, as well as tourism activity motivated by the UK's famous parks and gardens. This figure also encompasses horticulture's supply-chain and wage-consumption multiplier effects.
- **Around 568,700 jobs across the country were supported by ornamental horticulture and landscaping in that year,** through the same channels of impact. This is equivalent to 1 in every 62 jobs throughout the UK.
- **Some £5.4 billion in tax revenues to the Exchequer were linked to horticulture.** This is made up of taxes paid directly by the horticulture industries, as well as within its supply chains and in the consumer economy.
- **Garden tourism accounted for £2.9 billion of the sector's contribution to UK GDP.** The UK is regarded as the 'gardening capital of the world', and about one-third of all international tourist visits to the country involve at least one trip to a park or garden.
- **Engagement with gardening, green spaces and nature also offers profound benefits for mental, physical and social health and well-being.** Green spaces stimulate physical activity, ease stress and anxiety disorders, promote social cohesion and reduce crime. Reviews of evidence in this area demonstrate the economic value of these health and social benefits are worth many billions of pounds.
- **There is also a broad slate of crucial 'ecosystem services' that natural spaces and green infrastructure provide.** These range from absorbing air and noise pollution, to alleviating flood risks, mitigating extremes of temperature, and sustaining wildlife and biodiversity.
- **The presence and proximity of natural features adds an estimated £131 billion to the value of the UK's housing stock,** according to ONS**.** This figure captures some of the value that we place on access to green space and the natural world.
- **Not all benefits contributed by the natural world are attributable to horticulture.** But horticulture is key in managing and nurturing the infrastructure that provides these advantages. To this extent, its full economic contribution extends well beyond the estimates in this report.

EXECUTIVE SUMMARY

The economic value of UK ornamental horticulture and landscaping arises in a variety of ways.[1] Many different sectors engage in horticultural activity: from firms that grow ornamental plants and flowers, to manufacturers of garden equipment and supplies, to the wholesalers and retailers of those garden goods, as well as landscape and arboriculture professionals. In addition to the activity of these sectors—termed the "horticulture industries" in this report—horticulture also helps to drive tourism, through attracting visitors to the UK's many renowned parks and gardens.

370,300

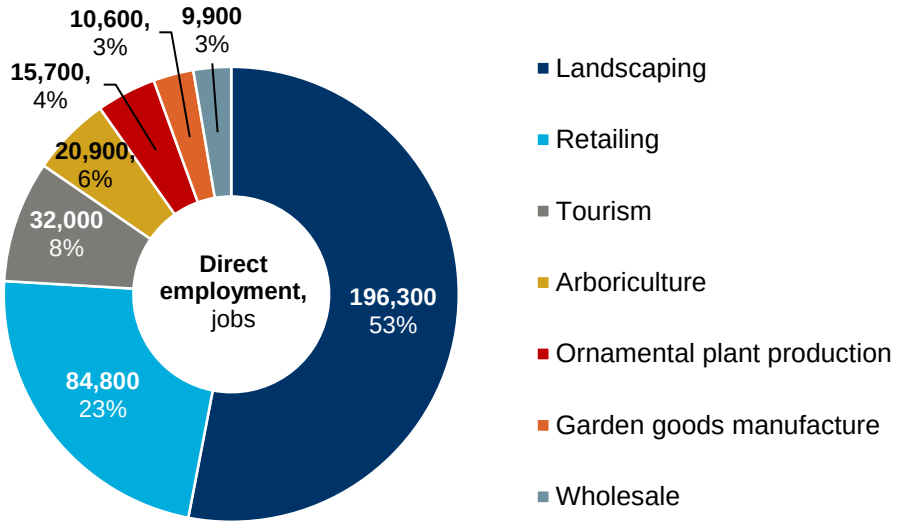
Direct jobs supported by horticulture in 2017

Enabling a £12.6 billion direct GDP contribution

Furthermore, gardening and green spaces have been shown to be remarkably beneficial to individual health and wellbeing, while also offering a raft of wider environmental benefits. These "consequential" aspects of horticulture also have substantial economic implications. To understand the precise nature, and full extent, of each of these facets of horticulture, the Ornamental Horticulture Roundtable Group (OHRG) commissioned Oxford Economics to conduct this economic impact assessment. This report provides the first comprehensive assessment of the many ways that horticulture boosts the UK's economy.

Ornamental horticulture supported 370,300 jobs in the UK during 2017. This is broadly equivalent to the entire agriculture sector, and encompasses workers employed across a whole range of industries, occupations and skill levels.

Fig. 1: Direct employment supported by horticulture, by sub-sector, 2017



Source: ONS, Kantar TGI, Mintel, HTA, Oxford Economics

[1] "Ornamental horticulture and landscaping" is defined as the services, goods, enterprises and natural assets related to gardens and gardening, public and private green spaces, floristry, garden leisure and tourism. See page 6 for a full definition.

£24.2 billion

Total GDP footprint of the UK's horticulture industries in 2017, including its 'multiplier impacts'

This footprint supported 568,700 jobs

Through a detailed examination of each of the sectors in which they operate, we estimate the horticulture industries directly added £12.6 billion to UK GDP in 2017—greater than the direct GVA contributions of the agriculture sector or aerospace manufacturing industry in the same year, according to the UK's national accounts. The firms and workers that make up the horticulture industries are also found to have generated £2.1 billion in direct revenues for HM Government in 2017.

The ornamental horticulture and landscaping industries also spent sizeable sums with British suppliers—in 2017, we estimate this figure reached £4.8 billion. This "supply chain effect" supports further economic activity, as these UK-based suppliers spend money with their own suppliers, and so on.

Through this "indirect" impact, we calculate that the horticulture industries and garden tourism gave rise to a further £4.8 billion contribution to GDP, and in doing so supported another 93,000 jobs. In addition, the spending of wages by staff employed in the horticulture industries, and in their supply chains, supported a further round of "induced" economic activity—giving rise to an additional £6.8 billion contribution to GDP, and sustaining the employment of another 105,300 people.

Taking these three channels together, ornamental horticulture's total contribution to UK GDP in 2017 reached £24.2 billion—equivalent to 1.2 percent of the nation's total output. The employment footprint of the horticulture industries supported 568,700 jobs, amounting to 1.6 percent of total UK employment. Additionally, the total tax revenues attributable to this sector's activities reached £5.4 billion in 2017.

£5.4 billion

UK tax revenues attributable to ornamental horticulture in 2017

About £1 in every £110 of all HMRC receipts

But the economic value that horticulture provides is not limited to these contributions to GDP and employment. Indeed, its impact is not even limited to being outside: indoor plants also measurably alleviate stress for those around them, increase social interaction, and help to remove chemicals that cause illness and irritations from the air. This has important implications for workplaces, as plants can help to support productivity and reduce sickness absence.

But gardening and engagement with green space is associated with a much broader array of physical and mental health and wellbeing benefits. Half of all English adults participate in some form of gardening, a proportion that is broadly stable across all income groups. Greater access to green spaces boosts physical activity, and can therefore avert some of the economic costs from disorders associated with sedentary lifestyles. Leading mental health organisations advocate for greater provision of therapeutic horticulture ("ecotherapy") as an effective intervention for people struggling with mental health disorders. Gardening has also been shown to improve learning outcomes among children, while among older demographics it is a crucial means of staying active and combating social isolation.

£131 billion

Aggregate boost to Britain's house prices

Attributable to the presence and proximity of the natural environment

Horticulture also helps to maximise many of the broader societal benefits provided by the natural world. The UK's plants and trees remove enormous amounts of harmful pollution from the air each year: in 2015 alone, the UK's vegetation provided air quality regulation with an economic value of £1.1 billion, while averting 1,900 deaths. This is enabled through tree banks and vegetation belts that absorb noise pollution; woodland and green spaces mitigating flood risks; parks and gardens supporting biodiversity and helping to regulate urban temperatures (cooling in the summer and insulating in the winter).

The value we place on these diverse benefits can be considered in terms of their influence on house prices. ONS research has estimated that access to green space and other natural features has an aggregate impact of £131 billion on the house prices of Great Britain. This figure captures the uplift in value contributed by proximity to the natural environment. It confirms that while we may not often consider its value in explicit terms, in practice we place an enormous value on the individual and social benefits that green space and natural beauty can provide.

In recognition of the broad and deep value that is contributed by the natural world, the government has launched a 25-year plan for the environment.[2] Some aspects of this strategy include the development of more green infrastructure, woodland creation, natural land management, and connecting people more closely with the environment for health and wellbeing purposes. These measures hint at the key role that the horticulture industries will play in delivering this strategy and enhancing the ecosystem services that the UK enjoys.

While not all of the benefits provided by the natural world can be attributed to horticulture, a considerable extent of such benefits do involve horticultural efforts and expertise. Landscape designers, architects and arboriculture professionals, gardeners and greenkeepers across the UK all play a key role in managing and nurturing the green infrastructure that provides these advantages. To this extent, horticulture's full economic contribution extends well beyond the estimates quantified in this report.

Fig. 2: Summary of direct and total impacts of UK horticulture industries, 2017

Sector	Contribution to GDP (£m)		Employment (Jobs)		Tax revenues (£m)	
	Direct	Total	Direct	Total	Direct	Total
Garden Goods	489	**1,261**	10,600	**23,300**	109	**320**
Ornamental Plants	750	**1,495**	15,700	**29,800**	122	**322**
Landscape Services	6,846	**11,608**	196,300	**278,300**	880	**2,216**
Retail	1,944	**3,669**	84,800	**112,300**	491	**969**
Wholesale	639	**1,391**	9,900	**22,800**	117	**328**
Arboriculture	709	**1,860**	20,900	**41,700**	149	**483**
Tourism	1,182	**2,883**	32,000	**60,500**	265	**724**
Total	**12,559**	**24,168**	**370,300**	**568,700**	**2,134**	**5,362**

[2] HM Government, "A Green Future: Our 25 year plan to improve the environment" (Government publication, 2018).

1. INTRODUCTION

Ornamental horticulture and landscaping provides economic value for the UK through a variety of channels. Planting, growing and maintaining gardens is an important leisure activity for millions of people, driving billions of pounds' worth of household spending on garden tools and services. This spending supports economic activity among the domestic industries that supply these goods and services, and also among the consumer-facing businesses that accrue the spending of horticulture workers.

The quality and diversity of the UK's many renowned parks, gardens and landscapes also attract millions of domestic and international visitors every year. The spending that these tourists contribute to the national and local economies supports further economic activity, employment and tax revenues.

The "consequential" effects that emerge from UK ornamental horticulture have important economic effects too. Engagement with nature and gardening delivers considerable physical and mental health benefits. In addition, biodiversity and environmental benefits and protections are provided by cultivated plants, forests, gardens and managed landscapes. While these advantages have significance that extends well beyond economic quantification, they clearly have economic implications that must also be considered to understand UK horticulture's true value.

To arrive at an independent estimate for the size of the ornamental horticulture and landscaping industry, and to better understand the nature and extent of all these economic impacts, the Ornamental Horticulture Roundtable Group (OHRG) commissioned Oxford Economics.[3] Through an assessment of the economic characteristics of horticulture activity in the UK, this report provides the first comprehensive assessment of the ways that horticulture boosts the national economy. The scope of the study is detailed in Box 1, overleaf.

The remainder of this report is structured as follows:

- Chapter 2 sets out the nature of UK households' demand for garden goods and services;
- Chapter 3 details our estimates of the scale and structure of the horticulture industries;
- Chapter 4 presents our modelling of the horticulture industries' "multiplier impacts" throughout the UK economy;
- Chapter 5 outlines the manner in which horticulture helps to drive domestic and international tourism;
- Chapter 6 provides an overview of evidence about the wider "consequential" economic impacts of horticulture;
- Chapter 7 summarises our assessment.

[3] The OHRG is a group of industry bodies representing businesses and organisations in UK ornamental horticulture.

BOX 1: SCOPE OF THIS ASSESSMENT

Where this report discusses the "horticulture sectors" or "horticulture industries", it refers to ornamental horticulture generally, encompassing the following specific activities:

(1) **Supply of garden goods.** This encompasses the industries manufacturing gardening tools and equipment, garden ornaments and furniture, fertilisers and agrochemicals, as well as structures such as garden fences, sheds and greenhouses.

(2) **Ornamental plant production.** This describes developers, growers and vendors of potted and bedding plants and trees, bulbs, cut flowers and real Christmas trees. It excludes the growing of any plants for commercial food production or consumption.[4]

(3) **Landscape services.** This element of horticulture covers the firms and workers that build and maintain landscapes, grounds, gardens and parks—whether on behalf of private households, commercial firms, or local/central government. It also encompasses landscape architects and designers, and those preparing and building green spaces during construction activity.

(4) **Retailing of garden products, plants and cut flowers.** This aspect includes the activities of specialised plant and foliage vendors, and garden centres. It also encompasses the horticulture-related spending that takes place within supermarkets, DIY stores and other retail channels and through online retailing; as well as the non-horticultural spend that takes place within garden centres.

(5) **Wholesale of garden products and flowers.** This element of horticulture describes the traders and logistics providers that ship garden products from their producers to the retailers who sell to the public, or other businesses.

(6) **Arboriculture.** This encompasses the planting and conserving of forests, parks, street trees and timber tracts, as well as forest and tree evaluation/management and environmental consulting. It excludes logging and the production of wood for manufacturing purposes.

(7) **Garden tourism.** This describes the value to the UK of both international and domestic visitors to its parks and gardens; and the role of these green spaces in supporting wider tourism spending.

[4] 'Grow your own' plants or herbs (which are typically grown for ornamental or leisure purposes) are counted as an ornamental plant, though they can be harvested for consumption (e.g. lavender, herbs, garden trees). It is very difficult to segregate purchases of plants grown for such purposes from those that are purely ornamental.

BOX 2: AN OVERVIEW OF ECONOMIC IMPACT ANALYSIS

The economic benefits of the horticulture industries (as defined in Box 1) are calculated using a standard means of analysis called an *economic impact assessment*. This approach is used to quantify the industries' impacts across three "core" channels, which can be understood as follows:

- *Direct impact*—relates to the horticulture industries' own activities, such as the GDP they generate, their direct employment and tax contributions;
- *Indirect impact*—encapsulates the activity and employment supported in the horticulture industries' supply chains, through their procurement of goods and services;
- *Induced impact*—comprises the wider economic benefits that arise when workers within the horticulture industries (and their supply chains) spend their earnings, for example in local retail and leisure establishments.

Three main metrics are used to present a picture of the horticulture industries' full economic footprint:

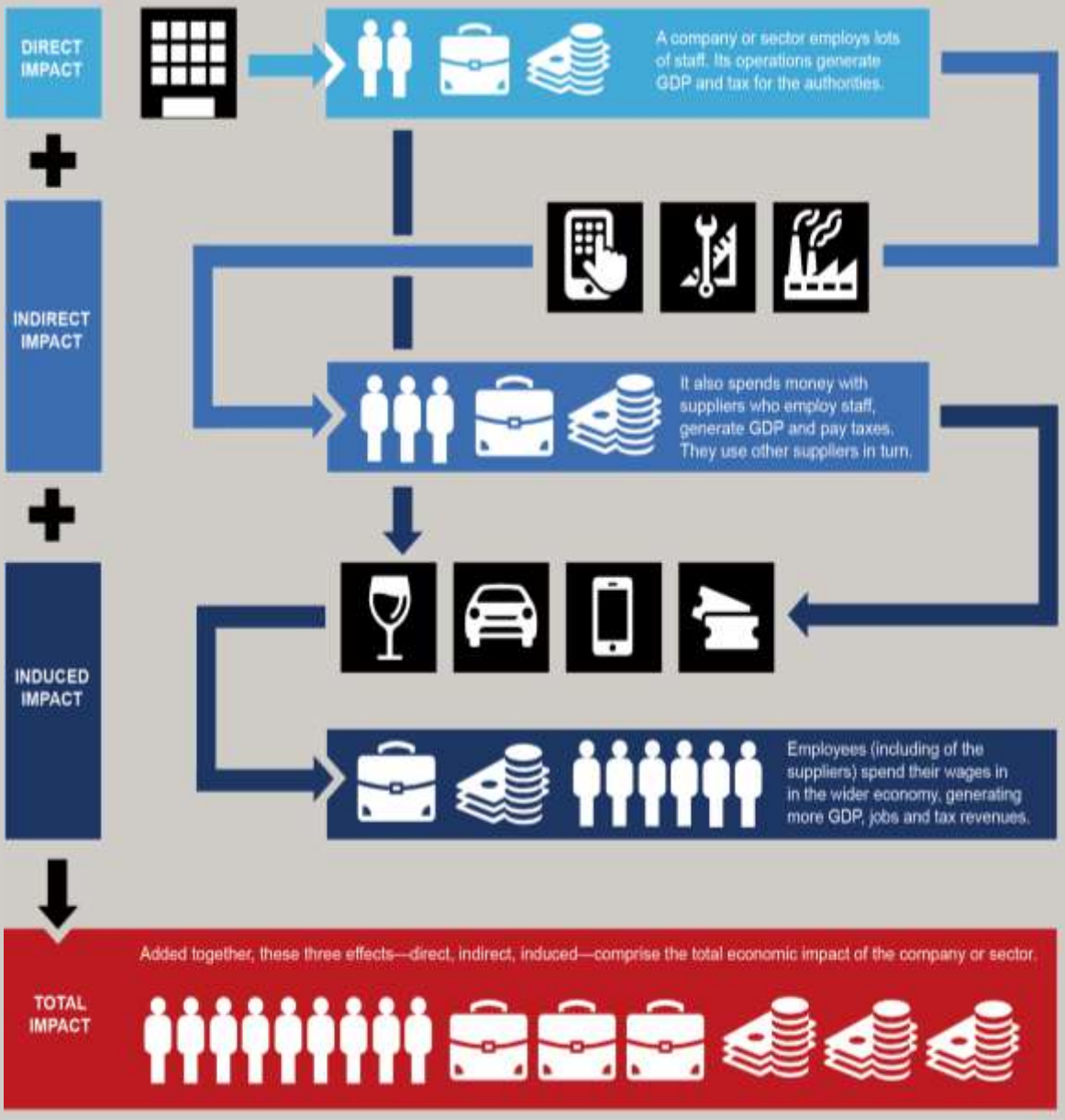
- *GDP*, or more specifically, the industries' gross value added (GVA) contribution to national GDP; [5]
- *Employment,* meaning the number of people employed, measured on a headcount basis*;* and,
- *Tax revenue*, the estimated fiscal contribution resulting from transactions and employment sustained by the horticulture industries.

The modelling is conducted using an input-output (I-O) based model of the UK economy, and regional modules describing the economies of its constituent nations and regions. This model was constructed by Oxford Economics, using macroeconomic, employment and tax data published by the Office for National Statistics (ONS) and HMRC.

Fig. 3 (overleaf) sets out how the various channels of a standard economic impact study relate to one another.

[5] GDP, or Gross Domestic Product, is the total value of final goods and services produced in an economy over a given period. The contribution of an individual producer, industry or sector to GDP can be understood as either: (i) the value of output (goods or services) less the value of intermediate inputs used in the production process; or (ii) the sum of compensation of employees (gross wages) and gross operating surplus (profits).

Fig. 3: How the different channels of economic impact add up

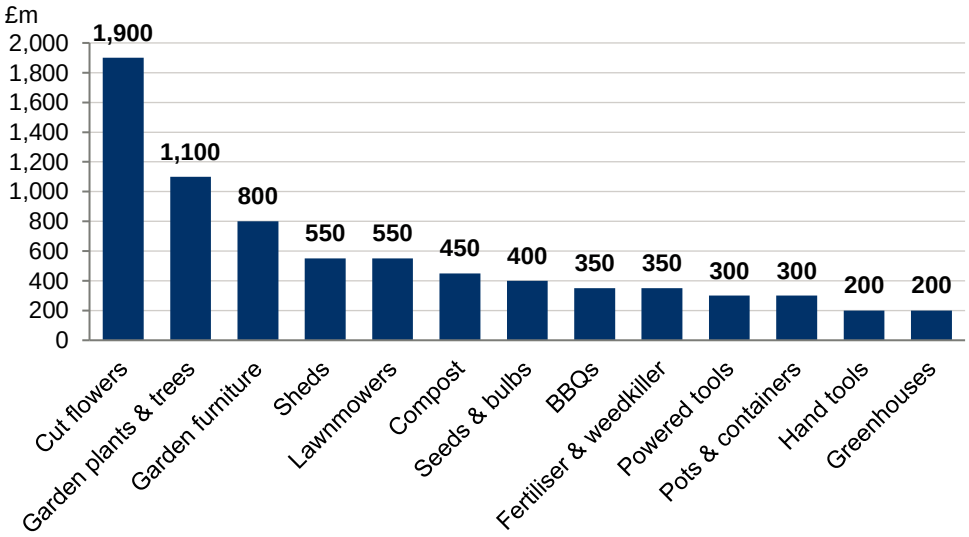


2. WHAT UK HOUSEHOLDS SPEND ON HORTICULTURAL GOODS

The spending of private households on their gardens is a major driver of horticulture in the UK. By purchasing flowers and plants, fertilisers and pesticides, garden tools and furniture, greenhouses and sheds, households generate demand for all aspects of the horticulture industries. These include manufacturers and retailers of garden goods, as well plant growers, and landscape service providers.

We estimate that UK households spent around £7.5 billion on garden goods in 2017. This spending, made up of routine purchases of supplies and equipment for gardening, as well as "bigger ticket" items such as sheds and greenhouses, is equivalent to £1 in every £100 of household spending. The aggregate sum is broken down across high-level product groups in Fig. 4.

Fig. 4: Household spending on horticultural goods, by product, 2017



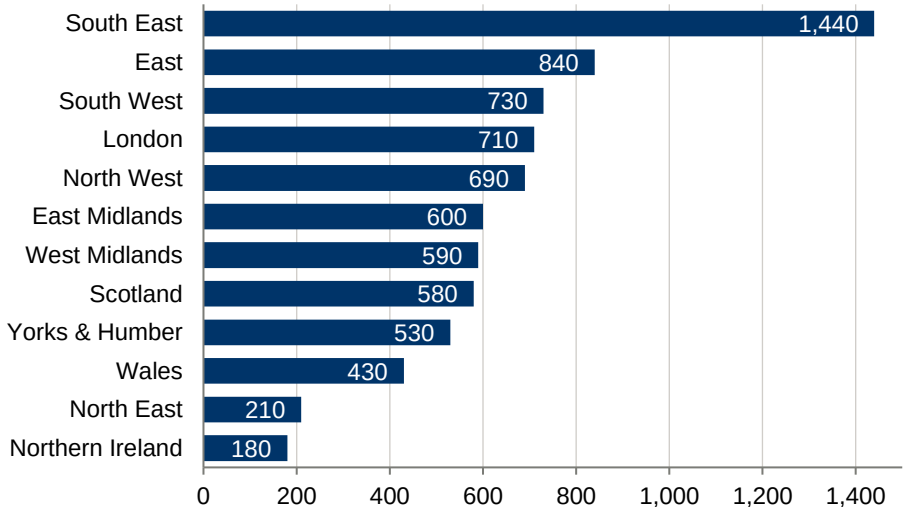
Source: Kantar TGI, ONS, Mintel, Oxford Economics

While many consumers prefer in-person purchases for their garden goods, the growth of online horticultural retailing reflects the wider consumer trend towards internet shopping. Consumer research shows that around £1 in every £10 of expenditure on garden plants is now spent online. When excluding plants, the extent of online spending on horticultural goods is even higher, reaching an estimated 23 percent in 2016/17.[6] This proportion exceeds the online share of all retail spending in the UK, that totalled 15 percent over the same period.

[6] Horticultural Trades Association, "Garden market analysis report" (Market research, 2017). This statistic is based on a consumer survey carried out by Ipsos MORI.

Households in the South East region accounted for almost one-fifth (19 percent) of all horticultural spending in the UK, or £1.4 billion of the total. There were eight other regions in which horticultural spend exceeded £500 million, as shown in Fig. 5.

Fig. 5: Household spending on horticultural goods, by region, 2017



Source: Kantar TGI, ONS, Mintel, Oxford Economics

This volume of consumer spending supports an extensive economic footprint. Much of this money is spent with garden centres, florists, and other specialist retailers of garden goods and plants; the remainder is spent with non-specialised retailers (i.e. supermarkets).[7]

Beyond these purchases of garden goods, households also spent around £2.4 billion on the services of gardeners and landscapers in 2017. These services range from routine maintenance and upkeep, to larger-scale works such as extensive redesign and landscaping. While routine maintenance is a far more common activity, its relatively lower cost means that it accounted for just under one-third (31 percent) of the total spend. The remaining two-thirds (69 percent) was made up of more significant landscaping projects that were far less prevalent, but costlier.

[7] We note that this disaggregation does not distinguish between in-store or online purchases. These retail sales for both garden centres and non-specialised retailers could take place through physical or online channels.

3. HORTICULTURE'S DIRECT IMPACT ON THE UK ECONOMY

The first task in understanding horticulture's economic value is to establish the scale and economic significance of the cluster of industries that directly undertake horticulture-related activities in the UK. This includes many of the sectors listed in Box 1, and requires the use of various data sources to measure the direct employment engaged in these sectors, the GDP contributions that arise from their activities, and the tax revenues generated as a result.

This amounts to the direct economic impact of UK horticulture. Much of it is comprised of the response of UK businesses and entrepreneurs to the household demands set out in Chapter 2. However, the sources of demand for horticultural activities include much more than households alone: central and local government, other business sectors, and the external world (exports) all help to drive demand for the horticultural goods and services explored in this chapter.

3.1 MANUFACTURE OF GARDEN GOODS AND EQUIPMENT

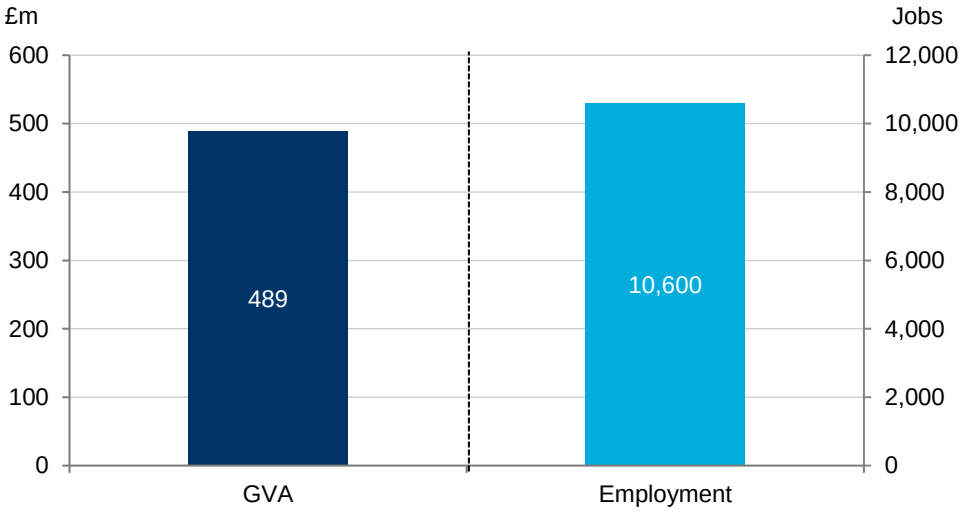
The annual household spending outlined in Chapter 2 generates substantial demand for the businesses that manufacture garden-focused goods and equipment. The creation of such a varied set of products involves firms from across the breadth of the manufacturing sector, so our assessment of garden goods suppliers includes potters who cast ceramic containers and pots, garment workers who fashion garden clothing and overalls, chemicals firms that synthesise fertilisers and weedkillers, metalworkers and machinists who forge hand tools, and engineers who manufacture complex powered or electrical machinery.

We appraised the scale and significance of this manufacturing activity using detailed official statistics on industrial production. These data allowed us to ascertain the volume and value of goods produced by UK manufacturers of various garden-related items. We also sought to isolate the "horticulture-specific" share of such production, by excluding the shares of production that were ultimately consumed for agricultural purposes.[8]

We estimate that manufacturers of garden goods in the UK sold around £1.3 billion worth of their products in 2017. In so doing, these manufacturers directly contributed an estimated £489 million to UK GDP. This GDP contribution can be thought of as the difference between the sale value of these manufacturers' total output, and the cost of external goods and services required to generate this output. Their manufacturing activity also supported around 10,600 jobs in 2017, as set out in Fig. 6 (overleaf).

[8] This isolation procedure draws upon data from the ONS' input-output tables, that records the extent to which different goods and services are consumed by various sectors of the economy. This allowed us to estimate the demand for (e.g.) agro-chemicals that was contributed by households and landscape services firms, and compare this with that of the agriculture sector and food manufacturers.

Fig. 6: Direct GDP and employment contributions among firms supplying garden goods and equipment, 2017



Source: ONS, Eurostat, HTA, Oxford Economics

Tax revenues also emerge from the activities of these garden goods suppliers. The profits they generate, the operational purchases they make from other businesses, the wage payments made to their employees, and business rates payable on their premises all combine to form a sizeable revenue stream for the Exchequer. Our modelling suggests that suppliers of garden goods and equipment directly generated £109 million in tax revenues during 2017.

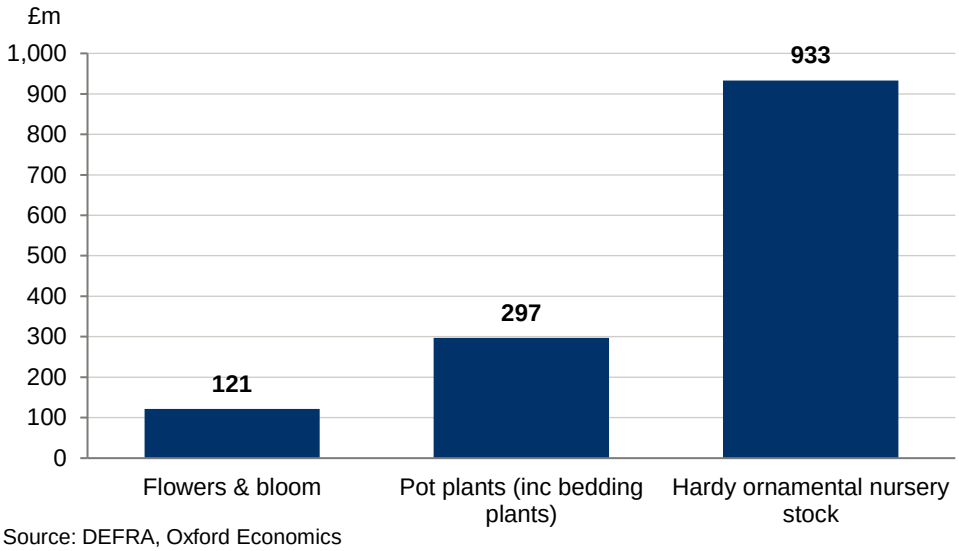
3.2 ORNAMENTAL PLANT PRODUCTION

Many of the decorative flowers and plants that populate the UK's gardens, landscapes and houses emerge from ornamental plant producers across the nation. These producers cultivate flowers, plants, shrubs, herbs, fruit and grasses that are distinguished by the fact they are intended to be enjoyed for their colours, forms, textures and/or scents or cultivation—rather than for a specific functional purpose (such as commercial food production, or the extraction of essential oils).

The careful raising of young plants and flowers in nurseries is a crucial element of horticulture. It is a prerequisite for many of the activities and economic value that is generated by the UK horticulture industries; for example, among retailers selling such plants and flowers, as well as landscapers who plant them within landscape projects.

Ornamental plants worth around £1.35 billion were produced and sold in the UK during 2017. Fig. 7 (overleaf) disaggregates this value among the main categories reported by DEFRA, and reveals that the overwhelming majority of this total was hardy ornamental nursery stock (HONS). The UK also imported ornamental plants worth £1.2 billion in 2017, with around two-thirds of this figure being made up of cut flowers.

Fig. 7: Estimated value of ornamental plant production in the UK, 2017, valued at producers' prices [9]



Source: DEFRA, Oxford Economics

The production of these flowers, plants and shrubs supported around 15,700 jobs in 2017. The combined efforts of these growers generated a contribution to UK GDP of some £750 million that year, and an estimated £122 million in tax revenues. Around two-thirds (64 percent, or £78 million) of this tax impact was made up of labour taxes, encompassing income tax plus employees' and employers' National Insurance Contributions (NICs).

3.3 LANDSCAPE SERVICES

The designing, building, planting and maintaining of the UK's green spaces requires substantial effort on the part of tens of thousands of workers across the country. These landscape services are performed upon a wide range of environments: for example, public parks and greens, the lawns and gardens of private and shared residences, the grounds of schools, hospitals, offices and other commercial buildings, sports greens, and alongside roads and train networks.

The landscape services sector, as described in this section, encompasses all activity in the UK that is focused on delivering such services.[10] It therefore includes both specialised landscape service firms (termed the "landscape services industry" overleaf), and also "wider landscaping activities" that are carried out as part of combined facilities support contracts, or by groundsmen and greenkeepers who are retained by other firms and public sector bodies.

[9] Consultation with OHRG revealed dissatisfaction with these classifications, that are currently the only ones utilised in official UK statistics for ornamental plant production. A brief discussion of this issue can be found in the Appendix to this report.

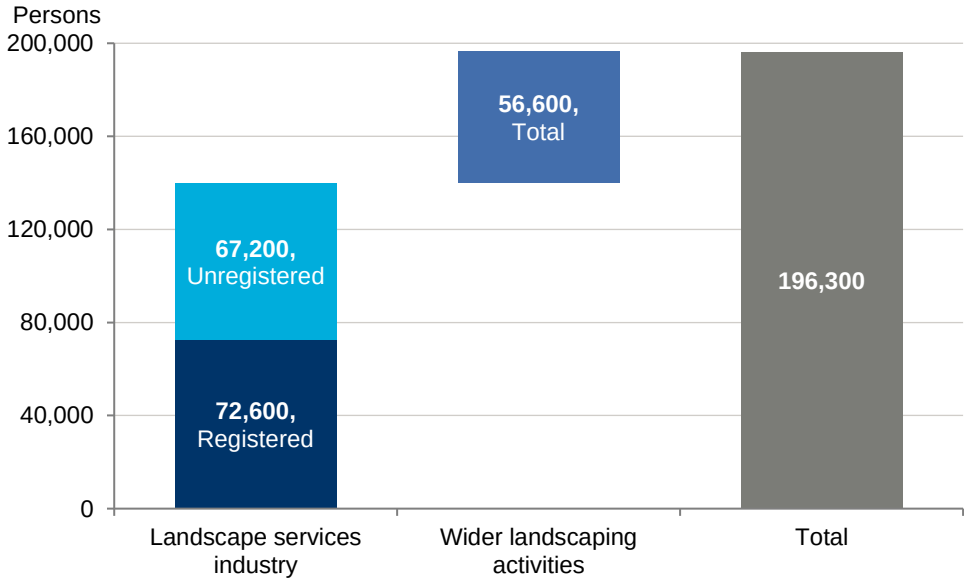
[10] It excludes the landscape gardening efforts of individuals and groups who do not undertake this activity for commercial purposes.

We estimate there were 196,300 workers helping to deliver landscape services across the UK in 2017. This figure includes the official scope of the sector as represented in national statistics (around 72,600 workers across 18,300 registered landscaping firms), but also those people who work within landscape services firms but in non-landscaping occupations, such as administrators and managers, drivers, accountants and caterers.

A further 67,200 people also work in the landscape services sector, but in a capacity that means they do not appear in official business statistics.[11] We describe this as the "unregistered" employment within the sector; it highlights how much of the UK's landscape services are delivered by small-scale entrepreneurs who run local operations.[12]

In addition, we estimate that another 56,600 people work in landscape-focussed roles within other industries ("wider landscaping activities"). This encompasses the landscaping professionals within firms that plant and manage green spaces as part of broader service contracts, or those that work within construction companies that design and prepare green space around housing developments. It also captures employees of central and local government bodies who carry out landscaping work, as well as workers retained by other businesses to tend to and maintain their grounds. The relative scale of these three segments is shown in Fig. 8.

Fig. 8: Landscape services employment in the UK, 2017



Source: ABS, APS, BEIS, Oxford Economics

[11] See Appendix 2 for further details on the methodology used to derive this estimate.

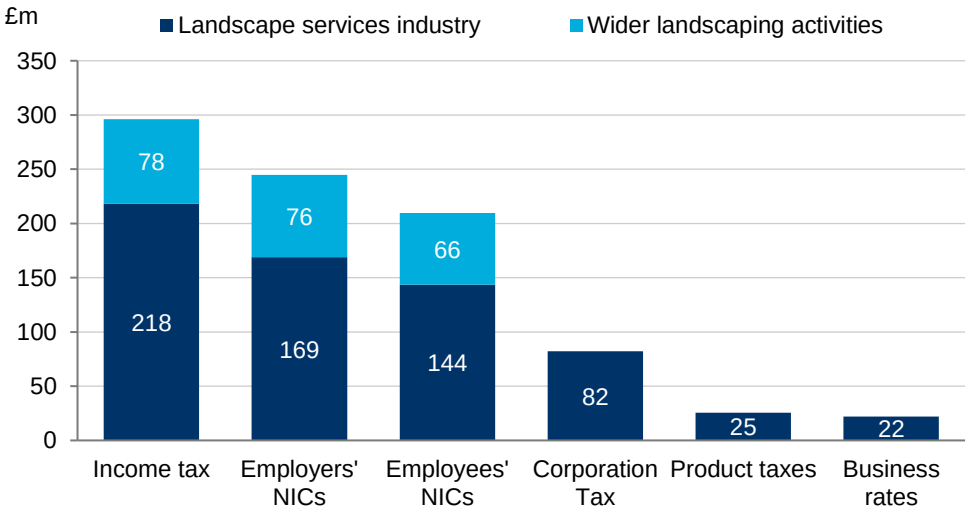
[12] This figure is based on the ONS' Annual Population Survey (APS), which is a household survey rather than one of businesses. The employment we describe as 'unregistered' predominantly describes self-employment and workers within sole proprietorships. Unregistered does not imply that this activity is illicit; rather, that it occurs at a scale which falls below the relevant VAT/PAYE thresholds that require an official business registration.

The landscaping activity carried out by these workers directly supported an estimated £6.8 billion contribution to UK GDP in 2017— equivalent to 0.3 percent of UK GDP in that year. This figure assumes that the value added by landscape workers in other sectors is broadly equivalent to the average worker within the landscape services industry.[13]

The activity that drives this GDP impact also encompasses the export of landscape services by domestic firms. The UK's reputation as a leading horticultural centre helps to generate considerable international demand for its garden designers, landscape architects and consultants. While this demand is exemplified in some very significant and high-profile landscape projects around the world, it has not been possible to measure the extent of these exports using official statistics.

The full scale of UK landscape services activity supports significant government revenues, through a variety of different tax streams. Taxes on the profits, purchases and premises of landscape service firms totalled an estimated £130 million in 2017. The labour taxes chargeable on these firms' employment amounted to a further £531 million; while the income taxes and NICs of landscape workers in other sectors of the economy reached an estimated £220 million. These tax streams are shown in Fig. 9.

Fig. 9: Direct tax contributions of landscape services, 2017



Source: ONS, HMRC, Oxford Economics

3.4 RETAIL SALE OF GARDEN GOODS AND EQUIPMENT

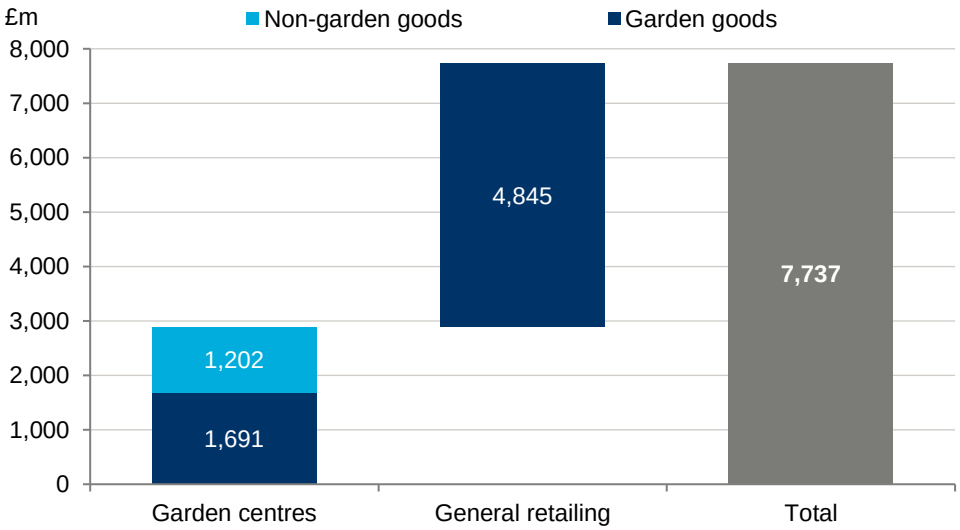
Consumer spending on horticultural activities sustains a large economic footprint. As explored in Chapter 2, household purchases of garden supplies and equipment totalled about £5.6 billion during 2017, a sum that rises to £7.5 billion when including cut flowers. Using ONS statistics on retail turnover by type of store, as well as survey data from HTA members, we estimate how this

[13] This assumption is adopted because the content of the work carried out by an 'in-house' landscape worker will likely more closely resemble that of a worker within the landscape services industry than, for example, the average worker in a head office, a hospital or school.

horticulture-related spending was split between garden centres and non-specialised general retailers, such as supermarkets. This breakdown is shown in the 'garden goods' series within Fig. 10 below.

In addition, an important proportion of garden centres' turnover is attributable to the sale of non-garden goods. Other valuable sources of turnover for garden centres include catering income, garden books and magazines, pet supplies, aquatic equipment and Christmas ranges. We set out these results separately, since although they form part of the economic impact of garden centres, they are not strictly driven by horticulture-related consumer spending.[14]

Fig. 10: Net retail turnover attributable to horticulture, £m, 2017 [15]



Source: ONS, Kantar TGI, Mintel, HTA, Oxford Economics

This disaggregation allows us to compute the direct impact of this spending among both specialist and general retailers. This acknowledges the different economic characteristics of garden centres relative to, for example, large supermarkets that accrue much of the UK's horticulture-related consumption spending.

Our modelling suggests that the retail sale of horticulture goods directly added around £1.9 billion to UK GDP in 2017.[16] Over half of this was accounted for by garden centres, with the remainder by general retailers. Garden centres' outsized share, compared with their share of total retail turnover, is due to their operating margin—approximately double that of general retailers, which tend to be characterised by enormous supermarket

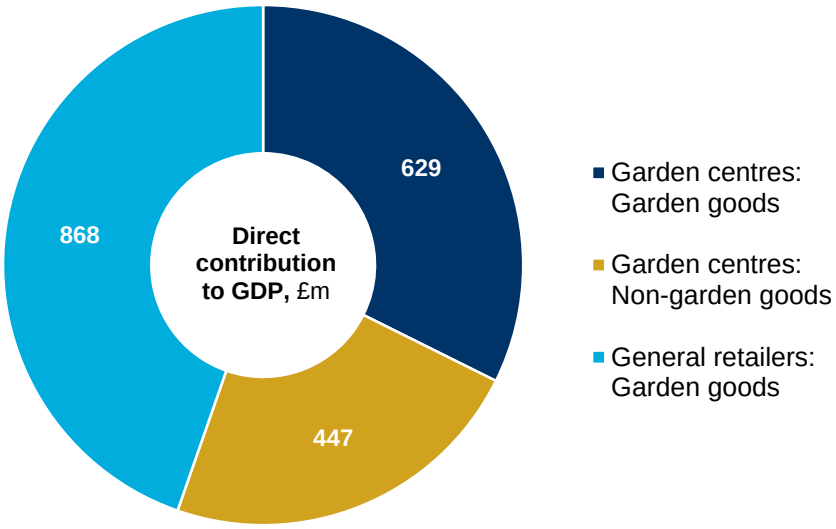
[14] This 'non-garden' revenue can be thought of as dependent upon the garden centre's horticultural operations. For example, the sales of a café within a garden centre would likely not take place without people visiting the retailer primarily for garden supplies.

[15] In this chart, 'net turnover' refers to turnover excluding VAT.

[16] This figure includes the value realised through the retail sale of non-garden goods in garden centres. It is exclusive of the GDP generated by the production of garden goods that are sold via these retailers (as explored in Section 3.1). This describes the value added by retailers alone.

operations with relatively slim margins. The components of this GDP contribution are shown in Fig. 11 below.

Fig. 11: Direct contribution to GDP of horticultural retail, £m, 2017



Source: ONS, Kantar, Mintel, HTA, Oxford Economics

The sale of garden goods, along with other non-garden sales by specialist garden centres, directly supported 84,800 jobs in 2017— 2.9 percent of the UK's retail workforce that year. Garden centres' own employment totalled an estimated 48,700 people. Along with this, we estimate that horticultural spending with the UK's general retailers helped to support a further 36,100 jobs.[17]

We also estimate that around £491 million worth of taxes accrued to the Exchequer, as a result of this retail activity. Over one-quarter of this (29 percent) was made up of business rates, reflecting the high average rateable values of retail premises. Another half was made up of labour taxes on the horticulture-dependent retail workforce, with the remainder accounted for by corporation taxes, and product taxes on the sector's procurement.

3.5 WHOLESALE OF GARDEN GOODS AND EQUIPMENT

While retail outlets are the channel through which consumers generally obtain horticultural supplies, there is also a considerable logistical effort to deliver these goods to such retailers. Many types of ornamental flowers, plants and shrubs are delicate and require careful handling, storage, and transportation. Wholesalers and logistics providers ensure such plants are shipped intact from nurseries and greenhouses to garden centres and supermarkets, contributing considerable economic value in the process.[18]

[17] This figure assumes that the sale of garden goods within general retail is equivalently labour-intensive as other sales they make; i.e. the rate of employment per £1m turnover for general retailers is applied to their garden-related turnover.

[18] We estimate the value of these services using official data on the wholesalers' trading margins for various types of goods, sourced from the Annual Business Survey. See Appendix 2 for further detail.

We estimate that specialist wholesalers of plants and flowers contributed around £340 million to UK GDP during 2017. This element of the horticulture industries employed around 5,900 people.

However, this alone would be an incomplete picture of the economic contribution made by wholesale of horticultural products. Non-specialist wholesalers also transport garden goods and equipment, and contribute further economic value. When including this element of the sector, we estimate that the direct GDP impact of wholesale of horticultural products reached £639 million in 2017. This scale of activity directly supported 9,900 jobs during that year, and gave rise to about £117 million in tax revenues.

3.6 ARBORICULTURE

Arboriculture describes a diverse set of tree- and woodland-related activities, not all of which are considered part of the horticultural industries as defined in this report. Our assessment includes those workers and organisations focused on activities such as the planting, thinning and management of forests (both natural and planted), parks and street trees, carrying out inventories and evaluation, conservation, pest control, and facilitating woodland recreation and tourism. The scope excludes logging, the production of timber for use in manufacturing or for burning as fuel, as well as forestry activities focussed on the gathering of wild produce such as mushrooms, berries and nuts.

There were around 20,900 workers engaged in arboricultural activities during 2017—of which around 14,600 engaged in the planting, growing and management of trees (silviculture), whether in natural or planted forests, or in tree nurseries. A further 6,400 worked in other areas such as evaluation and inventories, fire protection, research, and public administration.

This activity directly generated approximately £709 million in contributions to UK GDP in 2017. Silviculture accounted for almost two-thirds of this (63 percent, or £446 million), with the remainder added by assorted support activities.

Around £149 million in tax revenues emerged from this arboriculture activity in the same year. Virtually all (95 percent) of this was made up of labour taxes, encompassing the income tax and NICs paid on the salaries of arborists and forestry workers.

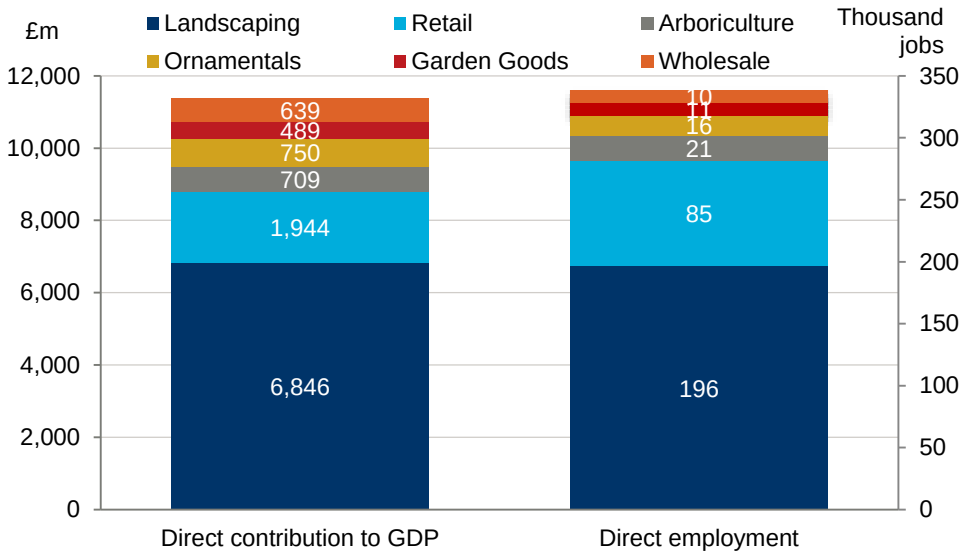
3.7 DIRECT IMPACT SUMMARY

In aggregate, all of these horticulture-focused activities are found to have contributed £11.4 billion to the UK's output in 2017.[19] Around 60 percent of this direct GDP contribution was made by the provision of landscape services, which points to the ubiquity (and importance) of such services across the UK's green spaces. The retail sale of garden goods (and other non-garden goods within garden centres) accounted for a further 17 percent of the total annual

[19] Please note that these summary figures exclude garden tourism (see Chapter 5). This drives the differences between these summary figures and numbers presented in the summary to this document.

contribution to GDP, underlining the value realised through providing plants, flowers and garden supplies to the general public.

Fig. 12: Direct GDP and employment contributions of horticulture industries, 2017

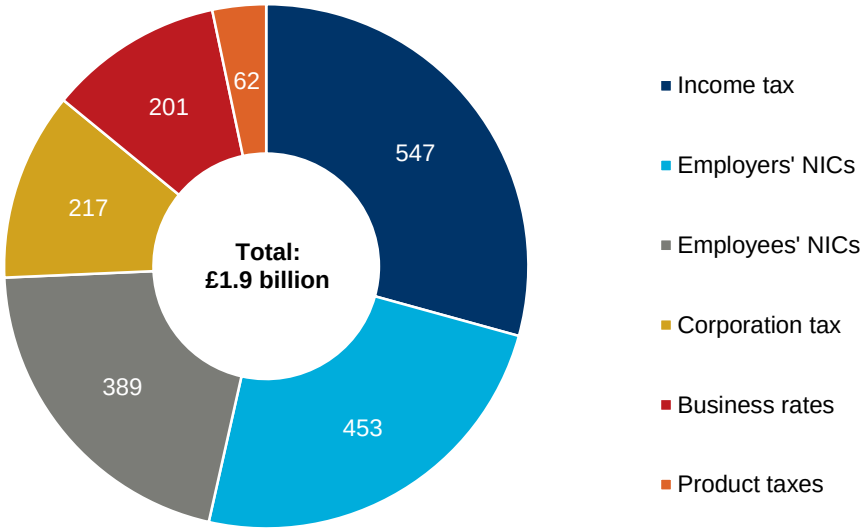


Source: ONS, DEFRA, Eurostat, Oxford Economics

The UK horticulture industries also supported the employment of an estimated 338,200 people in 2017. This is shown, along with the industries' direct contribution to GDP, in Fig. 12 (above). Landscapers and retailers again dominate this aspect of the direct impact, between them accounting for 83 percent of the total. This suggests that these activities are relatively more labour-intensive than other horticulture sub-sectors such as wholesale, or the manufacture of garden goods.

These sectors of ornamental horticulture also generated almost £1.9 billion in tax revenues for the UK Exchequer in 2017. This sum, equivalent to 0.3 percent of total government revenues for that year, is broken up into various tax streams in Fig. 13.

Fig. 13: Direct tax contributions of the horticulture industries, 2017



Source: ONS, DEFRA, HMRC, HTA, Oxford Economics

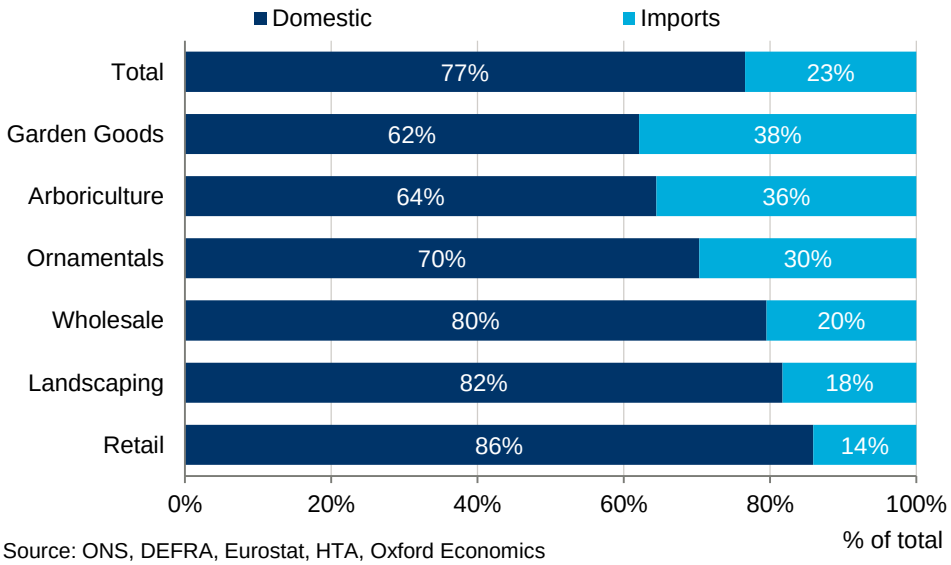
4. INDIRECT AND INDUCED IMPACTS

Aside from the substantial "direct" contribution that the horticulture industries make to the UK economy, they also stimulate further economic activity across the nation through their supply chain and wage-spending "multiplier impacts". By purchasing inputs of goods and services from other businesses, horticulture firms support jobs, GDP and taxes along their supply chains. This is known as the "indirect" impact of the sector. Similarly, horticulture firms' paying of wages (and the wage payments within their supply chains that are linked to horticulture's demands) supports consumption spending, which in turn sustains economic activity in the consumer economy. The associated economic output, employment contribution and tax revenue are captured in our modelling as the "induced" impact.

4.1 INDIRECT IMPACT

To produce goods and provide services, horticulture firms purchase inputs from a wide range of suppliers. In 2017, businesses producing garden goods and ornamental plants, providing landscape and arboricultural services, and working in horticulture wholesale and retail spent some £6.2 billion on operational inputs of goods and services. Almost a quarter of this (23 percent) is accounted for by imports, as shown in Fig. 14. [20]

Fig. 14: Geographic source of procurement by the horticulture industries, 2017 [21]



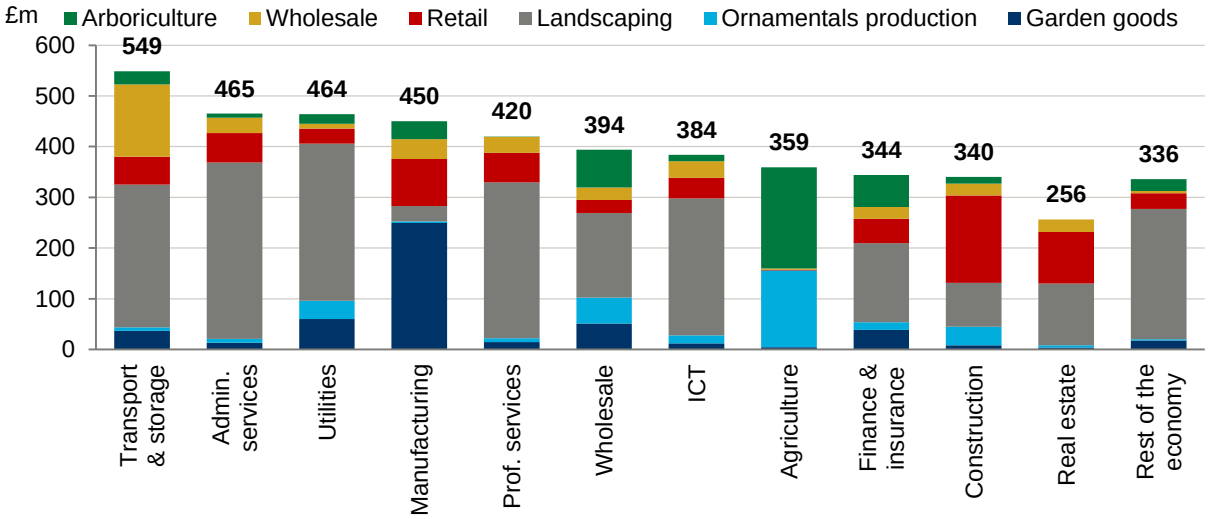
Source: ONS, DEFRA, Eurostat, HTA, Oxford Economics

[20] This supply chain analysis excludes the expenditures that elements of the sector make with one another, to avoid the double-counting of any activity. The economic significance of these transactions are captured in each sub-sector's direct impact.

[21] In this chart, the retail sector's procurement activity describes its operational inputs, but excludes goods that are bought and sold for resale in the same condition (i.e. its retail stock). Retail sector procurement would encompass (e.g.) its rent and utilities payments, purchases of furniture and fixtures, logistics, professional services, finance and insurance, ICT costs, etc.

This procurement of inputs from other domestic industries, amounting to £4.8 billion, initiates the first stage of the horticulture sector's indirect impact. This spending supports output and employment, not only with the businesses that directly supply the horticulture industries, but also with their suppliers, and so on along the entire length of the supply chain. In this way, the horticulture sector's economic footprint extends across many other industries throughout the UK. Fig. 15, below, provides our estimated breakdown of the sector's domestic spending with its "Tier 1" suppliers.

Fig. 15: Domestic procurement of the horticulture industries, by sector, 2017

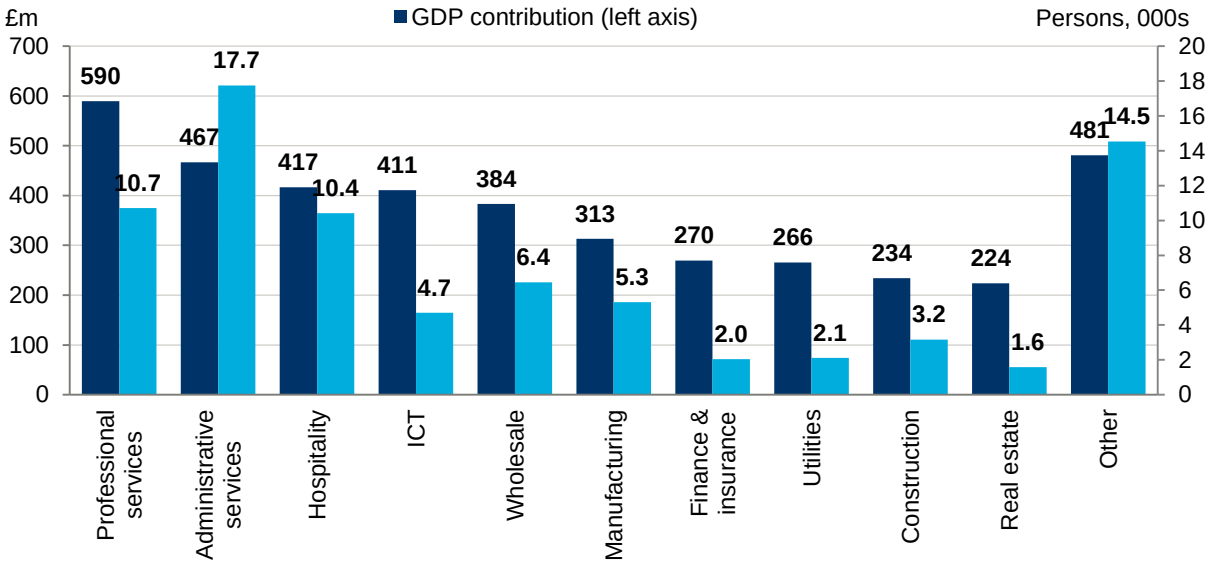


Source: ONS, BEIS, DEFRA, Oxford Economics

The largest share of domestic horticulture procurement spending, accounting for 49 percent of its in-UK expenditure, was made by landscape services activities. This sub-sector spent more than £2.3 billion with UK businesses in 2017. The next-largest expenditure was accounted for by firms in the retail and garden goods sub-sectors, accounting for 15 percent and 11 percent of the horticulture industries' total procurement, respectively.

In total, the horticulture sector supported a £4.1 billion contribution to UK GDP through its procurement spending in 2017. The largest share of this was made by firms in landscaping activities, with their £2.1 billion GDP contribution accounting for over half (51 percent) of the total. The sector's expenditure also sustained some 78,700 people in employment along its supply chain. The full distribution of sectors that enjoyed this indirect GDP impact is set out in Fig. 16 (overleaf).

Fig. 16: Sectoral distribution of the indirect impact of the horticulture industries, 2017



Source: ONS, DEFRA, Eurostat, HTA, Oxford Economics

This procurement activity also generates considerable revenues for the UK government. The output, profits and employment of these industries are all subject to taxes, a proportion of which are dependent on the procurement demands of the horticulture sector.

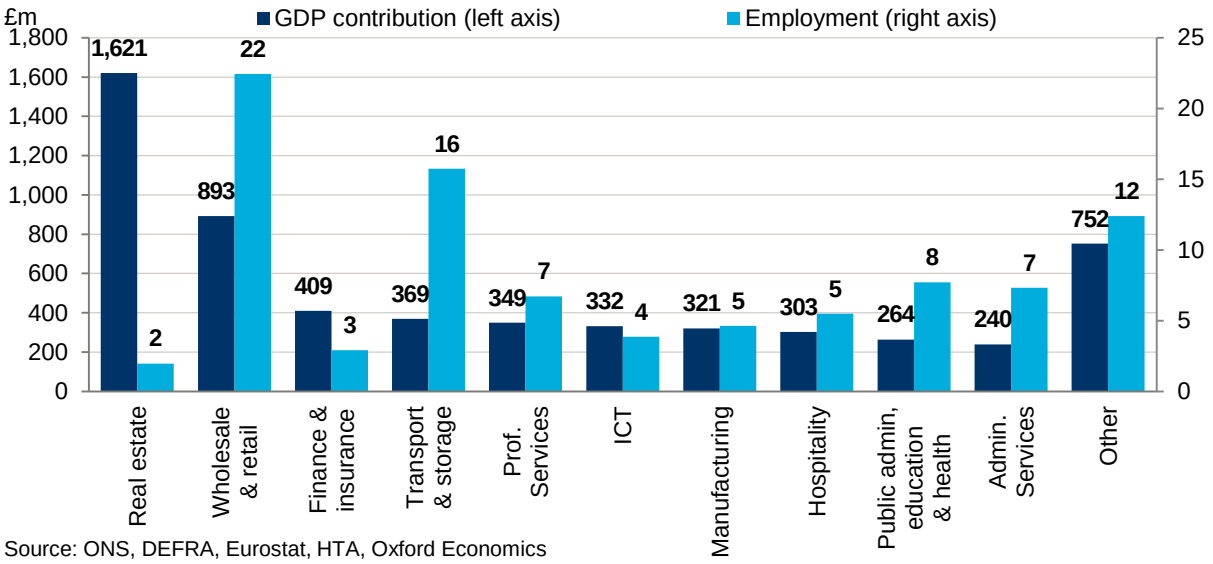
In 2017, the horticulture industries indirectly enabled more than £983 million in taxes for the Exchequer, throughout their supply chains. This was comprised of some £674 million in labour taxes (encompassing income tax plus NICs), and some £136 million in corporation tax. The remaining £173 million was made up of other taxes on products and production.

4.2 INDUCED IMPACT

Firms in the horticulture industries paid some £5.2 billion in gross wages to their 338,300 employees in 2017. These workers, as well as staff at firms along the industries' supply chains, spend a portion of their wages in the UK consumer economy—for example, in retail and leisure establishments.

Through this wage-financed consumption, the horticulture sector generated a further £5.9 billion contribution to GDP in 2017. This accrued to many sectors of the consumer economy, with the largest GDP impact felt by the real estate, and wholesale & retail industries (see Fig. 17, overleaf). The GDP contributions supported in these industries totalled £1.6 billion and £893 million respectively, accounting for 28 percent and 15 percent of horticulture's total "induced" contribution in 2017.

Fig. 17: Sectoral distribution of the induced impact of the horticulture industries, 2017



Source: ONS, DEFRA, Eurostat, HTA, Oxford Economics

The horticulture sector also sustained some 91,200 jobs in 2017 through this "consumption multiplier effect". The largest proportion of these were at firms in the wholesale & retail, and transport & storage industries. Horticulture supported around 38,200 jobs in these industries, or 42 percent of the total. The relatively larger employment impact in these industries, relative to their GDP contributions, reflects the labour-intensive nature of their production.

Through the induced channel, the horticulture sector enabled a £1.8 billion contribution to the Exchequer in 2017. The largest driver of this tax contribution was VAT charged on wage-financed consumption purchases, and other product taxes on suppliers, which collectively came to around £924 million. A further £586 million comprised of labour taxes, with the remainder made up of corporation tax and business rates.

5. ORNAMENTAL HORTICULTURE'S ROLE IN UK TOURISM

The UK's many famous gardens and parks are hallmarks of the nation's cultural offering, and play a prominent role in driving tourism. The existence of attractive and vibrant green spaces in all nations and regions of the UK helps to attract millions of visitors from all over the world. More than half a million people attended the Royal Horticultural Society's (RHS) Flower Show in 2018, and millions more watched coverage of the RHS Chelsea Flower Show. The UK is often referred to as the 'gardening capital of the world', and both international and domestic visitors contribute billions of pounds worth of spending each year, while commonly reporting visits to parks and gardens as important features of their trips.

This hints at some of the wider economic benefits that are sustained by the horticulture sector. Trips that involve visits to these attractions generate enormous economic value, and such attractions depend upon the horticulture industries to remain viable and appealing. Many of their plants and trees are contributed by domestic producers, with maintenance performed by landscapers and groundskeepers who utilise equipment supplied largely by UK manufacturers of garden goods.

The role of horticulture in managing and maintaining these green spaces is clear. However, it is less straightforward to establish exactly how important these green spaces are in driving tourists' decisions—both in terms of where they take trips, and how much they spend while doing so. Put another way, what element of this tourism activity might be lost without the presence of quality UK's parks and gardens, and the vibrancy they enjoy thanks to the horticultural industries' efforts and expertise?

To answer this question, our analysis seeks to quantify the extent of tourism activity that is attributable specifically to parks and gardens. This follows an approach developed by VisitBritain that is intended to appraise what proportion of UK tourism activity is motivated by various visitor attractions. First, tourism statistics are used to measure the spending contributed by various types of visitor (both domestic and international). Subsequently, survey evidence from ONS and VisitBritain is used to assess which activities were undertaken during these trips, and how important they were in motivating the visit.[22]

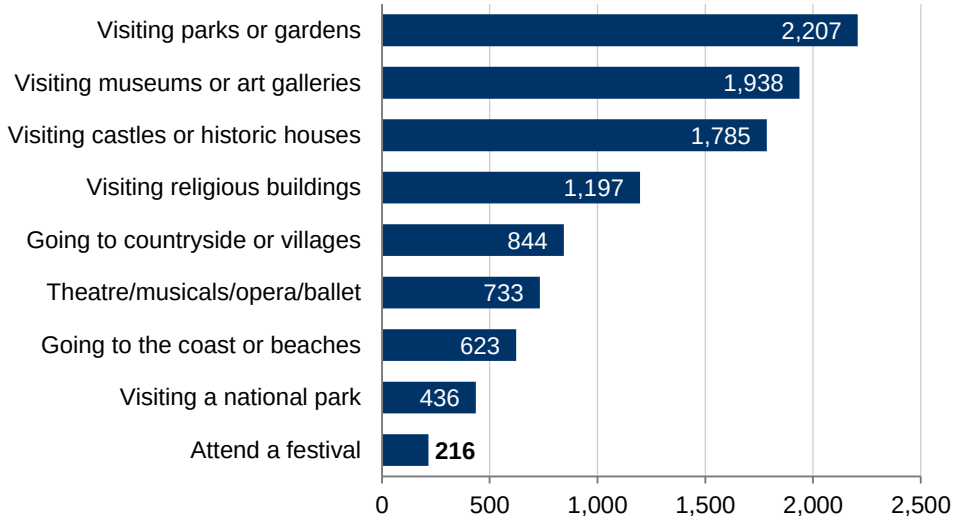
[22] This survey evidence is not available for international visitors. For these visitors, total spending on a given inbound trip is allocated equally across all activities undertaken by the visitor. Spending that takes place on trips that are undertaken for business reasons, for study, or to visit friends and relatives are then 'discounted' by 25-75%, to acknowledge the fact that these purposes were the main drivers of the visit.

5.1 TOURISM SPENDING ATTRIBUTABLE TO PARKS AND GARDENS

Parks and gardens are especially prominent among all the reasons that international visitors take trips to the UK. ONS data show that in 2016, 11.9 million inbound tourism trips to the UK involved at least one visit to a park or public garden – around one-third (32 percent) of all inbound visits in that year. This means that visits to parks and gardens are the most common activity for international tourists out of nine such activities listed in the International Passenger Survey.

Following VisitBritain's approach, we estimate that £2.2 billion of spending by overseas tourists was attributable to visiting UK parks or gardens in 2017.[23] This amounts to over a fifth (22 percent) of all spending for which an attributable reason could be identified. We note that this spending did not all take place at parks and gardens: rather, it encompasses all goods and services that tourists purchased during their visits, including hotel stays, restaurant meals, retail items, train and bus fares, airline tickets, as well as other cultural and recreational spending.

Fig. 18: Inbound tourist expenditure attributable to various activities, 2017

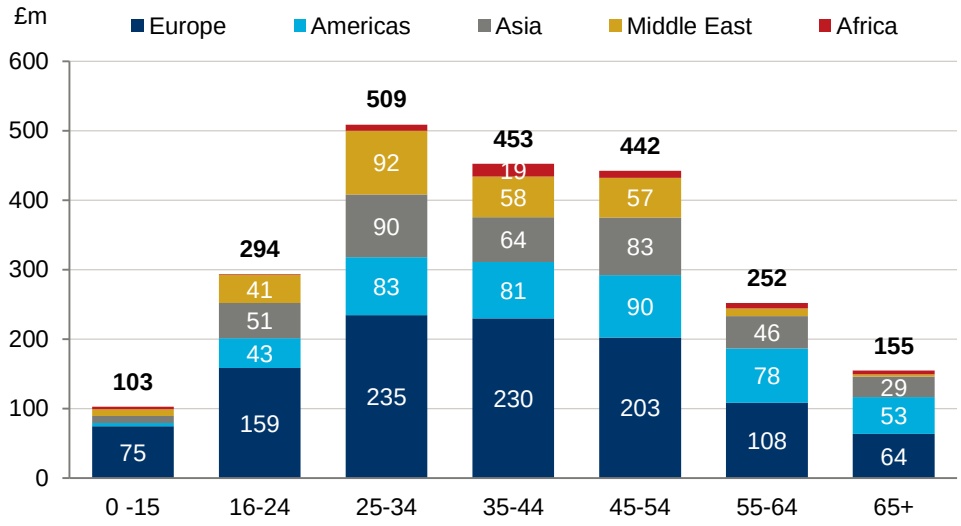


Source: ONS, VisitBritain, Oxford Economics

The tourism spending attributable to parks and gardens is contributed by visitors of all ages, from all regions of the world. Fig. 19 (overleaf) illustrates how much of the £2.2 billion spent in 2017 was accounted for by visitors from each age group and region of origin, underlining the diverse appeal of the UK's parks and public gardens.

[23] This figure adjusts for multi-activity trips, ascribing only a portion of the spending from such visits to parks and gardens. It excludes the expenditures of those tourists that did not undertake any of the activities listed in the International Passenger Survey.

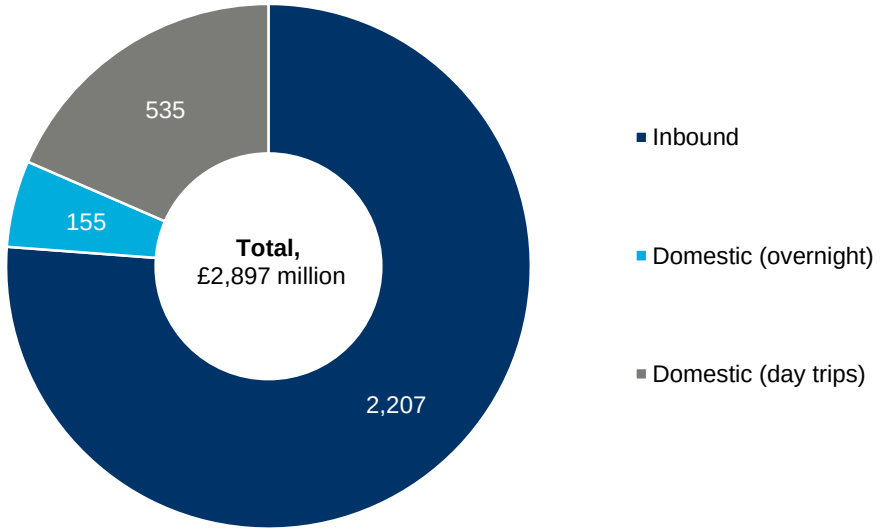
Fig. 19: Inbound tourist expenditure attributable to parks and gardens, by visitor age group and region of origin, 2017



Source: ONS, VisitBritain, Oxford Economics

When we also include domestic tourists, our modelling suggests that in 2017, the UK saw around £2.9 billion worth of tourism spending that was attributable to parks and gardens. International visitors to the UK accounted for over three-quarters (76 percent) of this total spend, and their £2.2 billion annual expenditure is "additional" to the UK economy—amounting to exports of tourism services to overseas residents. The remaining £690 million was accounted for by domestic (intra-UK) visits, including holidays that involved overnight stays, as well as day trips. The full breakdown is shown in Fig. 20.

Fig. 20: Estimated tourism spending attributable to visits to UK parks and gardens, 2017



Source: ONS, VisitBritain, Oxford Economics

5.2 ECONOMIC IMPACT OF HORTICULTURE-ATTRIBUTABLE TOURISM

This spending accrues to the UK's tourism industries—the collection of businesses across various sectors that directly serve the demands of inbound and domestic tourists. Examples of these include the accommodation sector, food services, transportation, retailers, sports, and the creative & cultural industries. To understand how much spending flows to each industry, we employ the ONS' Tourism Satellite Accounts (TSAs). These set out the goods and services that tourists of various types spend their money on.

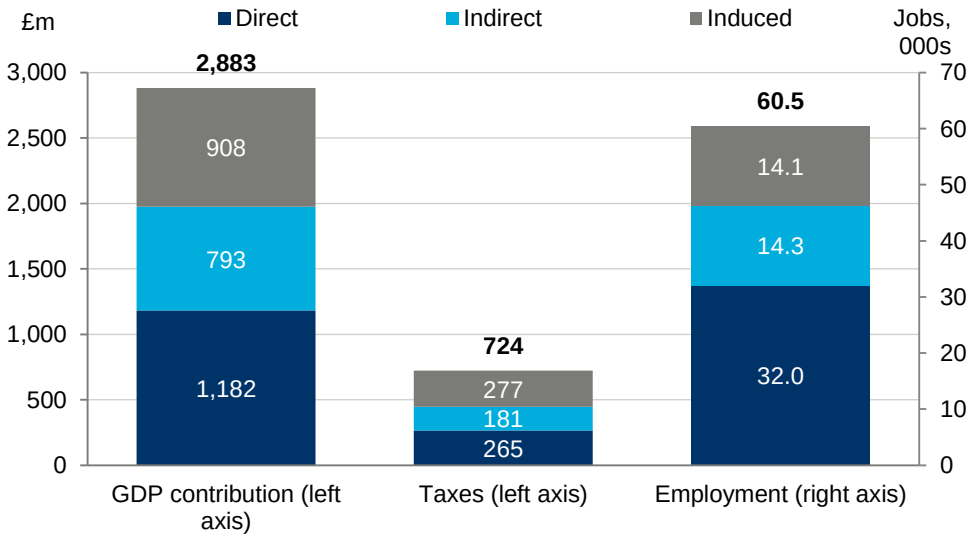
We estimate that in 2017, the visitor spending attributable to parks and gardens resulted in a £1.2 billion contribution to GDP from these tourism industries. This direct GDP impact was associated with 32,000 jobs and around £265 million in tax revenues in 2017.

In order to produce this output, the tourism industries also draw upon a broad and varied network of supply chains. This transmits the demands of tourist spending across (e.g.) professional and administrative services, utilities, manufacturing, and wholesalers. Through this mechanism, parks and gardens-attributable tourism spending stimulates a wider "multiplier impact" that cuts through all sectors of the economy. This "indirect" impact generates further GDP contributions and tax revenues, and supports many thousands more jobs.

In addition to this, the employees within the tourism industries (and among their supply chains) earn wages, and spend some of this money in the consumer economy. We also quantify this "induced" impact, capturing the fraction of wage-financed consumption that is linked to the parks and gardens-attributable tourism.

Across all three of these channels, we estimate that £2.9 billion in GDP was supported by tourism activity that is attributable to visits to the UK's parks and gardens in 2017. This scale of economic activity was enabled by some 60,500 workers, and gave rise to around £724 million in tax revenues for the Exchequer. These impacts are set out in Fig. 21.

Fig. 21: Total economic impact of horticulture-attributable tourism, 2017



Source: ONS, VisitBritain, Oxford Economics

6. THE 'CONSEQUENTIAL' IMPACTS OF UK ORNAMENTAL HORTICULTURE

The benefits discussed so far in this report—while undoubtedly significant—are only a partial picture of the value that horticulture contributes to the UK economy, and to society more broadly. There are manifold further advantages that arise through less visible channels which are harder to measure, but nonetheless crucial to understanding horticulture's full economic value to the nation.

For many people in the UK, the gardens, parks and green spaces that are underpinned by horticulture amount to their primary interaction with the natural world. In an increasingly urbanised society, this means that peoples' enjoyment of the life-enhancing effects of plants, trees and nature—and the benefits they provide for individual physical health and mental wellbeing—is ever-more dependent on the horticulture industries. These benefits, while tacitly understood for many generations, are also quantified in an extensive and growing body of research literature.

While the advantages that greenery and plants provide are wide-ranging, in this chapter we focus mainly on some of the channels through which economic implications may be felt. To this end, we first consider the social and neighbourhood-level benefits that can be provided by horticulture and gardening. We then turn to the physical, mental and social health benefits that accrue from gardening and engagement with outdoor green spaces. Finally, we look with a more macro-economic perspective at the wider value that is contributed by nature, and the sensible management of the natural environment.

6.1 THE SOCIAL IMPORTANCE OF HORTICULTURE AND GARDENING

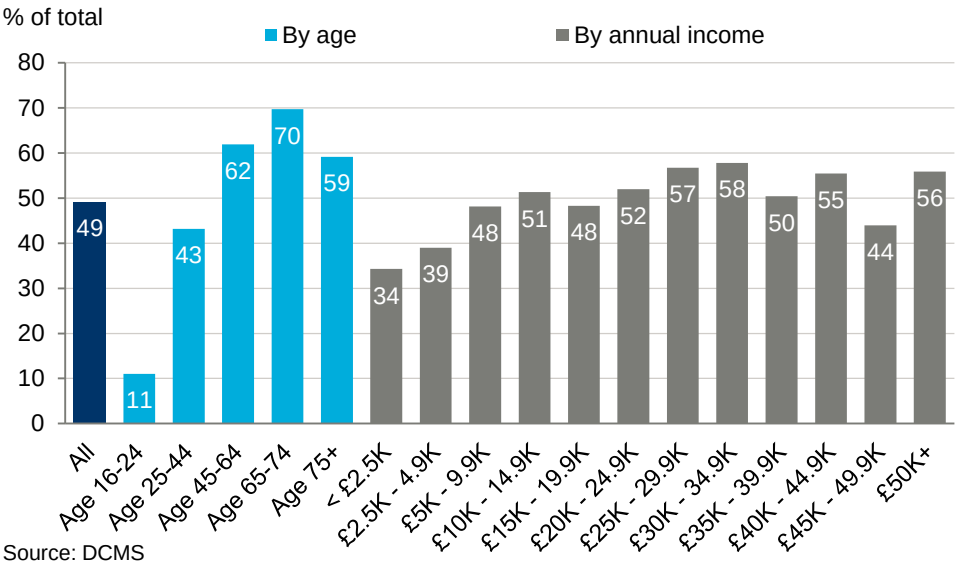
Engagement with horticulture and green spaces offer a diverse range of social benefits to communities and neighbourhoods. The individual and social value that it offers is evidenced by the widespread engagement in green space across the country: official data show that 25 million people in England make weekly leisure visits to natural environments such as parks, gardens, or rural areas.[24]

Green activities attract individuals of all ages, with the importance we place on gardens and gardening tending to increase with age. DCMS figures from the Taking Part survey show around half of all English adults take part in gardening – and that the proportion of adults who garden rises with age (as shown in Fig. 22). Gardening also becomes *relatively* more important among older age groups, as other leisure activities decrease in prevalence for these demographics. The King's Fund's review commented on the reasons that

[24] Nautral England, "Monitor of Engagement with the Natural Environment" (Headline report, 2015-16).

gardening can be particularly valuable for older people: a garden can provide a focus later in life, an opportunity to continue lifelong learning, and an opportunity to ease loneliness and social isolation.[25]

Fig. 22: Adult participation in gardening in England, 2015/16



Source: DCMS

But gardening, and its benefits, are not solely the preserve of older groups. Children and young people are a focus of many of gardening initiatives, as there is a growing awareness that isolation from the natural world can have an enduring negative effect on childhood development. For example, involving pupils in school gardening produces a wide range of positive outcomes, over and above the benefits for physical, mental and emotional wellbeing that are observed in all age groups. These include enhancing literacy and numeracy, developing fine motor skills, and fostering a positive attitude to healthy food choices.[26] All of these could combine to form an important determinant of children's future health and life outcomes.

Gardening is also accessible to people from all parts of the income distribution. As shown in Fig. 22, those on the very lowest incomes (less than £5,000 per year) are significantly less likely to participate in gardening. But other than this most-deprived segment, roughly half of people across all income groups participated in gardening during 2015/16. This points to the social inclusion benefits that gardening can offer: it need not be an expensive pastime, but rather one that people from all backgrounds can engage in. It is an important communal activity, providing opportunities to establish social connections and reduce isolation, outcomes that are crucial for supporting individual wellbeing.

[25] David Buck, "Gardens and health: Implications for policy and practice", 2016: 25-6.

[26] Rowena Passy, Marian Morris and Frances Reed, "Impact of school gardening on learning", *Final report for the Royal Horticultural Society*, 2010.

Moreover, for many people the benefits of participating in horticulture extend beyond its value as a hobby or pastime. It can also have significance as an educational and professional pursuit: over the past five years, around 26,000 people have achieved qualifications through the RHS. The value to individuals of such educational schemes are another channel of economic benefits that are not quantified in this report.

There is also compelling evidence that green space can strengthen social ties in a local area, helping to both reduce crime and fear of crime. Proximity to green infrastructure helps to foster greater social cohesion: open, inviting and well-tended green areas allow all citizens to mix as equals, enabling personal interactions and building social capital and a sense of neighbourhood. There is evidence that both property crimes and violent crimes are significantly lower around buildings and neighbourhoods with greater extent of greenery in their surroundings, once controlling for other factors.[27] These varied social benefits from greener landscapes can interact and influence one another, further reducing crime and other societal ills.[28]

Many studies comparing urban locations have established the positive relationship between a local prevalence of gardens, trees, and green spaces, and house prices.[29] This relationship—observed in analyses spanning many different countries and cultures—demonstrates the near-universal importance that we ascribe to such green amenities.

The ONS has estimated the implicit value added by green and blue space to house prices in Great Britain at around £131 billion, which can be seen as a measure of the value we attach to proximity to such spaces. This analysis uses detailed mapping of natural features such as parks, fields, allotments, rivers, lakes and canals, to estimate the magnitude of their influence on nearby residential housing values.[30]

While a boost to house prices is not in itself an economic benefit, it confirms that we place a measurable value on the benefits that green space and natural beauty can provide. It also points towards the social benefits that could be realised through enveloping new housing developments in appropriate landscape schemes and green space.

6.2 HEALTH AND WELLBEING BENEFITS OF HORTICULTURE

The presence of indoor plants has extensive benefits for occupants of these spaces. Whether in the home or office, plants have been shown to have a calming and comforting effect on those around them, reducing stress and increasing self-esteem, and alleviating minor illnesses. In an office

[27] Frances E Kuo and William C Sullivan, "Environment and crime in the inner city: does vegetation reduce crime?", *Environment and Behaviour*, 33 (2001): 343-67.
[28] Michelle de Roo, "The green city guidelines: techniques for a healthy liveable city" (The Green City report, 2011).
[29] For example, Stephen Gibbons, Susana Mourato and Guilherme Mendes Resende, "The amenity value of English nature", *Environmental and Resource Economics*, 57 (2014): 175-96.
[30] Office for National Statistics, "UK natural capital: ecosystem accounts for urban areas" (Statistical bulletin, 2018).

environment, potted plants are associated with improved concentration, greater efficiency, and reduced sick leave among those who work near them.[31]

These effects are often linked to the cleansing effect that houseplants have on indoor air. Many consumer products, electronics, furnishings and building materials emit traces of pollutants and volatile organic chemicals into the air.[32] Such chemicals pollutants were identified in the UK's Health & Safety Executive's guidance on "sick building syndrome", as potential contributors to the phenomenon.[33] Houseplants can filter these compounds from the air in enclosed spaces. This is particularly relevant within modern, energy-efficient commercial buildings, where measures to mitigate heat loss can lead to tightly-enclosed indoor environments that enjoy relatively little outdoor air supply.

While indoor plants offer important benefits to occupants, there are even more pronounced and measurable health gains from spending time outdoors, and actively participating in gardening. Powerful physical and mental benefits arise from having a space next to (or near) the home that permits frequent engagement with nature, opportunities to plant and nurture vegetation, and potentially to consume self-grown vegetables, herbs and fruit. One assessment indicatively estimated that the weekly use of a domestic garden is worth between £171 and £575 per person, in terms of its physical and mental health benefits.[34] Aggregating this estimate across the UK's gardeners suggests national health and wellbeing benefits worth between £4.1 billion and £13.8 billion.

The King's Fund's review of evidence in the area summarises the channels through which these benefits can flow. Gardening can provide cognitive relief from the goal-oriented, problem-solving thinking states that dominate modern life, thereby alleviating stress. This is significant in light of the fact that stress and anxiety disorders are one of the biggest (and growing) features of mental ill health in the UK. These disorders have important economic implications, both through constraining human potential, and causing significant rates of sickness absence from work. In 2017 alone, 14.3 million working days were lost to stress, anxiety and depression (representing over 10 percent of all sickness absence in that year).

There are also major benefits from spending time in parks and other natural green spaces. These overlap considerably with those stemming from domestic gardening, and on some level the distinction between the two pastimes is simply a matter of scale. This section of our review focuses on how access to public green spaces can support mental health and wellbeing, encourage greater levels of physical activity, and alleviate social exclusion.

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[31] Plants for People, "Pots of Health: Houseplants - the secret ingredient to a healthy life".

[32] Kent D. Kobayashi et al., "Using houseplants to clean indoor air", *Ornamentals and Flowers*, 39 (2007).

[33] Health & Safety Executive, "How to deal with sick building syndrome (SBS)", 2000. SBS describes the unusual prevalence of minor illnesses and irritations that are experienced by occupants of certain buildings.

[34] Susana Mourato et al., "Economic analysis of cultural services" (UK NEA Economic Analysis Executive Summary, 2010), 26. The range reflects variations in monetary estimates for the value of a healthy year of life (quality-adjusted life year, or QALY).

Reviews of literature confirm there is a consistent and robust positive association between exposure to green spaces and physical activity.[35] This hints at the important role that the provision of green space could have in alleviating the large and rising healthcare burdens that emerge from physical inactivity. The World Health Organisation (WHO) reports that insufficient physical activity is the fourth-leading risk factor for deaths globally, and is a major risk factor for heart disease and stroke, diabetes, cancer, musculoskeletal problems, and falls among older people.[36] The multi-billion-pound annual costs of treating these disorders, and the loss of healthy life that is associated with them, amounts to an enormous economic burden. In the UK, active visits to green spaces were estimated to provide a societal gain worth around £4.4 billion in 2015, attributable to the improvements to health and well-being that such active visits delivered.[37]

There is additional evidence that access to green space directly delivers benefits for mental health, rather than solely as a facilitator for physical activity. For example, a 2015 longitudinal study that measured the mental health status of identical twins found that access to green spaces was significantly associated with reduced depression, even after adjusting for levels of physical activity.[38]

Whether directly, or as a facilitator for exercise, engagement with green spaces and the natural world clearly has great potential within treatment and interventions for mental distress. The mental health charity Mind has studied the efficacy of green exercise, or "ecotherapy", and suggests that exercises and activities such as nature walks, gardening or local conservation projects could be prescribed as one part of broad-based interventions for those struggling with their mental health.[39] Natural England's review of similar nature-based interventions and "care farming" concluded that the evidence for their effectiveness is unambiguous, and recommended that their provision should be scaled-up to reach as many people in need as possible.[40]

6.3 WIDER ENVIRONMENTAL BENEFITS OF HORTICULTURE

There is a growing awareness of the enormous economic value that the natural environment contributes to society. Since 2012, ONS has been developing systems and methods to account for this value in the UK, from the aggregate stock of "natural capital" to the annual flows of so-called "ecosystem services" it provides. This framework attempts to capture the range of benefits that nature offers, from resources used in production processes

[35] Peter James et al., "A review of the health benefits of greenness", *Current Epidemiology Reports*, 2 (2015): 131-42.

[36] World Health Organisation, "Physical activity factsheet" <http://www.who.int/news-room/fact-sheets/detail/physical-activity> [accessed 2 June 2017]

[37] Office for National Statistics, "UK natural capital: ecosystem accounts for urban areas" (Statistical bulletin, 2018), 22.

[38] Hannah Cohen-Cline, Eric Turkheimer and Glen E Duncan, "Access to green space, physical activity and mental health: a twin study", *Journal of Epidemiology and Community Health*, 69 (2015): 523-9.

[39] Mind, "Ecotherapy: The green agenda for mental health" (Executive summary, 2007), 5-6.

[40] R. Bragg and G Atkins, "A review of nature-based interventions for mental health care" (Natural England Commissioned Reports no.204, 2016).

(such as timber), to cleaner air and carbon capture, and the recreational value of green space and woodland.

For example, recent ONS estimates have valued the pollution removal services contributed by the UK's plants and trees. Its analysis concluded that air pollution removal by UK vegetation averted 1,900 deaths (equivalent to an estimated 27,000 years of life) in 2015 alone. The economic value of this air quality regulation—that encompasses the reduced burden on the NHS, as well as a valuation of the wellbeing benefits from longer and healthier lives—reached £1.1 billion for that year, when measured in today's prices. Furthermore, the UK's vegetation removed 25.5 million tonnes of CO_2 from the atmosphere in the same year, a service to the global environment worth more than £1.5 billion.[41]

The health benefits contributed by vegetation in urban areas are especially significant. Since most of the UK population resides in urban areas, the services of urban vegetation in reducing their exposure to airborne pollutants are particularly valuable. This fact also hints at the contribution of horticultural workers and landscape managers in supporting these health benefits, since it is by their efforts that urban vegetation and green infrastructure is developed and maintained.

The development and careful management of woodlands can also play an important role in alleviating flood risk, and minimising the damage that does occur through flooding. Woodland creation and improved soil management can reduce water runoff in upstream areas, and increase floodplain storage.[42] This could prove especially valuable in areas where engineered flood defences would be prohibitively costly, and may grow in importance as global climate change is predicted to increase the frequency of extreme weather events.

Green space also helps to prevents flooding in urban areas, while also offering other climate-regulation effects. Vegetation, soil, ponds, green roofs, and other green urban features can play an important role in a sustainable urban drainage system (SUDS). Collectively, they help to reduce the rate of water runoff that traditional drains must clear after heavy rainfall.[43] The value of stormwater alleviation services provided by London's trees alone has been estimated at around £2.8 million per year.[44]

Domestic gardens and other green space in cities also help to moderate high urban temperatures, as they absorb less heat than pavements and road surfaces. Vegetation can act as shade for buildings and pedestrians, and

[41] Office for National Statistics, "Developing estimates for the valuation of air pollution removal in ecosystem accounts", 2017: 12-3.

[42] Scottish Environment Protection Agency, "Natural flood management handbook" (Handbook, 2015), 14.

[43] Forest Research, "Sustainable urban drainage systems", in *Tools and resources* <https://www.forestresearch.gov.uk/tools-and-resources/urban-regeneration-and-greenspace-partnership/greenspace-in-practice/benefits-of-greenspace/sustainable-urban-drainage-systems-suds/> [accessed 4 Jun 2018]

[44] Treeconomics London, "Valuing London's Urban Forest" (Results of the London i-Tree Eco Project, 2015), 10.

also provide a further cooling influence via evapotranspiration.[45] These processes help to reduce the electricity consumption used for air conditioning (and the associated greenhouse gas emissions), which can be substantial in hotter months. In 2016, the cooling effect of urban green and blue space reduced average temperatures in the UK's major city regions by 0.63 to 0.88°C.[46]

Gardens and landscapes also help to preserve biodiversity, particularly within urban areas where species-rich habitats can be scarce. The provision of such spaces can support invertebrate wildlife, as well as birds and other small animals, and help to preserve the richness of species within the UK's landscapes. The provision of a diverse range of flower-rich habitats is beneficial for pollinator insects, and suitably abundant urban gardens and green space could be an important contributor to combating the long-term trend of pollinator decline.[47] While individual garden plots may be small, the contribution they make across the nation can be considerable. Residential gardens account for around 30 percent of the urban area within Great Britain, collectively amounting to almost 5,300km^2 of green space.[48] This is three times as large as the entire Greater London built up area.

As well as its benefits for regulating temperature and air quality, green infrastructure can also act as a barrier against detrimental noise pollution. This significant environmental hazard is linked to heart problems, sleep disturbance, impaired cognitive development, and other disorders.[49] For communities close to busy roads or railway lines, green banks and deep belts of vegetation can effectively reduce noise levels by hampering sound propagation.[50] In the UK's urban areas specifically, the annual health and wellbeing benefits from noise mitigation by vegetation were valued at £14.4 million in 2017.[51] Benefits such as these underline how green infrastructure is not only pleasant and visually appealing, but also forms an integral part of the ecosystem services that are fundamental to our wellbeing.

In order to recognise and preserve the broad and deep value that is contributed to society by the natural world, the government has launched a 25-year plan for the environment. [52] Some aspects of this strategy include large-scale woodland creation, enhancing flood defences through tree planting, river bank restoration and natural land management, connecting people more closely with the environment for health and wellbeing purposes, and developing

[45] Royal Horticultural Society, "Gardening matters: Urban gardens" (Report, 2011), 3.
[46] Eftec, "Scoping UK urban natural capital account - local climate regulation extension" (Final report, 2018).
[47] KCR Baldock et al., "Where is the UK's pollinator biodiversity? The importance of urban areas for flower-visiting insects", *Proc. R. Soc. B*, 2014: 282.
[48] Office for National Statistics, "UK natural capital: ecosystem accounts for urban areas" (Statistical bulletin, 2018).
[49] World Health Organisation, "Burden of disease from environmental noise" (Quantitative assessment, 2011).
[50] Patrick ten Brink, "Health and social benefits of nature and biodiversity protection" (European Commission presentation, 2015).
[51] Office for National Statistics, "UK natural capital: ecosystem accounts for urban areas" (Statistical bulletin, 2018).
[52] HM Government, "A Green Future: Our 25 year plan to improve the environment" (Government publication, 2018).

more green infrastructure. The inclusion of such measures hints at the key role that horticulture will play in delivering this strategy, and enhancing the ecosystem services that the UK enjoys.

Although not all benefits provided by the natural world can be attributed to horticulture, extensive aspects of such benefits do involve horticultural efforts and expertise. Landscape service workers, arboriculture professionals, gardeners and greenkeepers across the UK all play a key role in managing and nurturing the green infrastructure that provides these advantages. To this extent, horticulture's economic contribution extends well beyond the quantified estimates included in this report.

7. CONCLUSION

This report has detailed the varied ways that horticulture contributes value to the UK economy. It has set out the scale and economic characteristics of the nation's horticulture industries, and demonstrated how their £21.3 billion contribution to national GDP in 2017 was generated: through the industries' own activities, their UK-based supply chains, and the wage-financed consumption of people employed in the sector and among its suppliers. Through the same channels, the horticulture industries supported the employment of over half a million (508,200) people, and generated £2.8 billion in revenues for government in 2017.

In addition to these "core" economic contributions, horticulture enhances the appeal of the UK as a tourism destination. The UK's parks, gardens and green spaces attract international visitors from all over the world—as well as domestic residents—to enjoy their natural beauty. These visitors spend money with the UK's tourism industries, contributing further economic benefits for the UK. We estimate that tourism activity attributable to the UK's parks and gardens boosted national GDP by a further £2.9 billion in 2017, and sustained another 60,500 jobs. A summary of these impacts is set out in Fig. 23 below.

But the beneficial economic effects from enhancing the UK's natural beauty through horticulture do not end with this tourism impact. A wide literature of research has demonstrated how engagement with plants, gardens and other green spaces supports physical health and mental wellbeing. In this way, horticulture helps to avert some of the enormous economic burden associated with many physical and mental health disorders.

Horticulture also plays a central role in providing and preserving the UK's green infrastructure, and the ecosystem services they generate. While quantifying the value of this contribution was outside the scope of this study, it is nonetheless important to consider these consequential impacts when assessing horticulture's full economic and societal value to the UK.

Fig. 23: Summary of direct and total impacts of UK horticulture industries, 2017

Sector	Contribution to GDP (£m)		Employment (Jobs)		Tax revenues (£m)	
	Direct	Total	Direct	Total	Direct	Total
Garden Goods	489	**1,261**	10,600	**23,300**	109	**320**
Ornamental Plants	750	**1,495**	15,700	**29,800**	122	**322**
Landscape Services	6,846	**11,608**	196,300	**278,300**	880	**2,216**
Retail	1,944	**3,669**	84,800	**112,300**	491	**969**
Wholesale	639	**1,391**	9,900	**22,800**	117	**328**
Arboriculture	709	**1,860**	20,900	**41,700**	149	**483**
Tourism	1,182	**2,883**	32,000	**60,500**	265	**724**
Total	**12,559**	**24,168**	**370,200**	**568,700**	**2,134**	**5,362**

8. APPENDIX 1: REGIONAL RESULTS

Fig. 24: Regional breakdown of horticulture's economic impact, excluding tourism, 2017 [53]

Regional impact summaries	GDP impact (£m)		Employment impact (jobs)	
	Direct	Total	Direct	Total
North East	312	**782**	11,000	**19,000**
North West	1,412	**2,382**	34,800	**52,600**
Yorks & Humber	597	**1,361**	22,000	**36,000**
East Midlands	1,007	**1,841**	23,200	**38,900**
West Midlands	906	**1,747**	23,200	**38,100**
East	1,128	**2,051**	32,300	**47,500**
London	943	**1,841**	24,200	**33,800**
South East	2,030	**3,519**	71,500	**94,200**
South West	958	**1,880**	31,200	**47,700**
England	9,292	**17,405**	273,300	**407,900**
Wales	503	**1,082**	18,000	**30,800**
Scotland	1,295	**2,237**	37,700	**53,900**
Northern Ireland	287	**562**	9,300	**15,700**
United Kingdom	**11,377**	**21,286**	**338,300**	**508,200**

[53] The regional breakdowns in this chapter do not include horticulture's tourism impact. This is because tourism activity cannot be broken down along regional lines using the same methodology that is employed for other elements of the horticulture industries.

Fig. 25: Regional breakdown of horticulture's GDP impact, by sub-sector, 2017

Regional GDP Impact (£m)	Ornamental Plants		Landscape Services		Garden Goods	
	Direct	Total	Direct	Total	Direct	Total
North East	24	**60**	189	**421**	16	**51**
North West	90	**160**	997	**1,469**	37	**130**
Yorks & Humber	32	**84**	280	**601**	73	**142**
East Midlands	77	**140**	562	**890**	42	**129**
West Midlands	39	**111**	584	**966**	46	**125**
East	108	**176**	559	**988**	71	**151**
London	63	**137**	622	**1,098**	16	**66**
South East	179	**306**	1,247	**2,109**	50	**132**
South West	56	**141**	558	**967**	39	**113**
England	669	**1,314**	5,597	**9,510**	390	**1,040**
Wales	23	**61**	259	**513**	21	**53**
Scotland	11	**38**	838	**1,311**	69	**141**
Northern Ireland	47	**82**	151	**274**	9	**28**
United Kingdom	**750**	**1,495**	**6,846**	**11,608**	**489**	**1,261**

Regional GDP Impact (£m)	Retail		Wholesale		Arboriculture	
	Direct	Total	Direct	Total	Direct	Total
North East	46	**121**	8	**37**	27	**92**
North West	201	**377**	52	**111**	35	**134**
Yorks & Humber	122	**252**	60	**146**	31	**135**
East Midlands	160	**316**	119	**233**	48	**132**
West Midlands	148	**309**	28	**83**	60	**154**
East	240	**413**	113	**211**	36	**112**
London	197	**362**	36	**97**	10	**80**
South East	362	**604**	94	**168**	99	**200**
South West	186	**373**	38	**95**	80	**192**
England	1,662	**3,127**	550	**1,182**	425	**1,231**
Wales	86	**177**	12	**40**	101	**237**
Scotland	152	**277**	58	**125**	168	**346**
Northern Ireland	44	**89**	20	**44**	15	**46**
United Kingdom	**1,944**	**3,669**	**639**	**1,391**	**709**	**1,860**

Fig. 26: Regional breakdown of horticulture's employment impact, by sub-sector, 2017

Regional Employment Impact (jobs)	Ornamental Plants		Landscape Services		Garden Goods	
	Direct	Total	Direct	Total	Direct	Total
North East	600	**1,200**	7,100	**11,200**	300	**900**
North West	1,500	**2,900**	20,600	**29,500**	1,400	**3,100**
Yorks & Humber	1,000	**1,900**	10,900	**16,800**	1,000	**2,200**
East Midlands	1,100	**2,300**	10,100	**16,400**	1,400	**3,000**
West Midlands	1,400	**2,800**	12,400	**19,400**	1,000	**2,400**
East	1,400	**2,500**	17,700	**25,000**	1,200	**2,500**
London	1,300	**2,100**	15,800	**21,100**	300	**800**
South East	3,500	**5,700**	48,400	**61,900**	1,300	**2,500**
South West	1,900	**3,700**	15,500	**22,800**	1,100	**2,300**
England	13,700	**25,200**	158,400	**224,100**	9,000	**19,600**
Wales	600	**1,600**	9,400	**14,500**	300	**900**
Scotland	300	**700**	23,700	**32,100**	1,100	**2,300**
Northern Ireland	1,100	**2,200**	4,800	**7,600**	200	**600**
United Kingdom	**15,700**	**29,800**	**196,300**	**278,300**	**10,600**	**23,300**

Regional Employment Impact (jobs)	Retail		Wholesale		Arboriculture	
	Direct	Total	Direct	Total	Direct	Total
North East	2,200	**3,400**	200	**600**	800	**1,800**
North West	9,200	**12,200**	600	**1,700**	1,400	**3,200**
Yorks & Humber	5,800	**8,100**	1,300	**2,900**	2,100	**4,000**
East Midlands	7,500	**10,300**	1,900	**4,200**	1,200	**2,700**
West Midlands	6,800	**9,400**	400	**1,300**	1,200	**2,900**
East	9,300	**12,000**	1,600	**3,300**	1,100	**2,200**
London	6,000	**7,700**	500	**1,200**	300	**1,000**
South East	15,400	**18,800**	1,000	**2,100**	1,800	**3,300**
South West	10,000	**13,200**	700	**1,600**	2,000	**4,000**
England	72,100	**95,000**	8,200	**19,000**	11,800	**25,000**
Wales	3,700	**5,400**	200	**800**	3,800	**7,600**
Scotland	6,700	**8,700**	1,000	**2,200**	4,800	**7,900**
Northern Ireland	2,300	**3,200**	400	**900**	500	**1,200**
United Kingdom	**84,800**	**112,300**	**9,900**	**22,800**	**20,900**	**41,700**

9. APPENDIX 2: METHODOLOGY

HOUSEHOLDS' HORTICULTURAL SPEND

To understand the magnitude and structure of households' demand for garden goods and products, we drew upon a range of sources. Kantar TGI's detailed product-by-product sales figures were used to understand the magnitude of horticulture spending, across detailed product groups. These estimates were triangulated and sense-checked against ONS Family Spending data, figures from Kantar, as well as HTA's own survey evidence. ONS Family Spending figures used to estimate how this spending was distributed across UK regions.

GARDEN GOODS

To estimate the direct impact of garden goods production, we used PRODCOM data accessed via ONS and Eurostat. This is a dataset that records detailed production statistics across 3,900 different types of manufactured products. We identified a list of horticultural products from these data, and used these as the starting point for our analysis.

For certain products, that could be used for either horticultural or agricultural purposes, we adjusted total production to isolate horticultural demand. This adjustment drew upon data from the ONS' input-output tables, that records the extent to which different goods and services are consumed by various sectors of the economy. This allowed us to estimate the demand for (e.g.) agro-chemicals that was contributed by households and landscape services firms, and to compare this with demand from the agriculture sector and food manufacturers.

The resultant GDP contributions are estimated using the ONS' Annual Business Survey (ABS). This provides detail on the turnover and gross value-added (GVA, that is broadly equivalent to GDP) for many industries across the UK economy, including a detailed list of manufacturing sub-sectors. The ABS uses the same industrial classification as the PRODCOM database, albeit at a greater level of aggregation. We estimated garden goods' direct GDP impact using the same ratio of GDP to turnover, as is observed in the broader manufacturing sub-sector within which this production takes place. The employment impact of this production is estimated in the same fashion, using Annual Business Survey data on manufacturing employment.

ORNAMENTAL PLANT PRODUCTION

The production value of ornamental plants is sourced from DEFRA's Horticulture Statistics bulletin. We estimate the GDP impact of this production using a ratio drawn from HTA's survey of ornamental plant producers. Employment is estimated using Annual Population Survey (APS) figures for the plant propagation sector.

During this research, it became clear that there is some frustration among industry stakeholders regarding the suitability of the categories that are used in DEFRA's published statistics. Official statistics on domestic ornamental plant production currently cover just three broad categories, a classification that is seen as insufficiently detailed. It was also noted that past revisions to this scheme have impeded longer-term comparisons.

It was suggested that a more detailed breakdown, developed by OHRG and presented in Fig. 27 below, would align more closely with terminology that is used by growers, and understood by the wider horticulture industries. Collation of official statistics along these lines would allow trends that affect specific segments of the market to be identified and analysed, as these segments often have very diverse sources of demand (i.e. households, retailers, landscapers, exports, etc).

Fig. 27: Suggested categories for disaggregating ornamental plant production

Existing categories	Suggested revised categories
Flowers and bloom	Bedding plants
Pot plants	Hardy nursery stock
Hardy ornamental nursery stock	Herbaceous perennials
	Edible ornamentals
	Dry bulbs
	Cut flowers
	House plants
	Other garden plants

LANDSCAPE SERVICES

The direct impact of landscape services first uses ABS data on the landscape services industry. This provides estimates of the turnover, GDP and employment that arises through their activities. However, as outlined in the main report, household-based employment surveys reveal that there is much more employment within this sector than is suggested by ABS.

As such, we incorporate the estimated 'unregistered' employment using data from the APS. This encompasses self-employed and own-account workers, whose activities are not at a scale that necessitates VAT/PAYE registration, and thus do not appear in official business register-based statistics.

We estimate turnover per person among this workforce using a factor drawn from BEIS' Business Population Estimates (BPEs). This provides turnover estimates for unregistered workers within the broader sector, 'Services to buildings and landscape'. We calculated the ratio of turnover per worker among unregistered and registered workers in this broader sector. This ratio was then applied to turnover per worker as suggested in the ABS data, to estimate the average turnover that is accrued by unregistered landscape service workers.

Data from the APS that is disaggregated by both industry and occupation also reveal that gardeners, groundsmen and greenkeepers are employed within many other sectors of the economy. Some are horticultural professionals within other facilities service firms, that provide landscape services as part of broader service contracts. Others are employed within sports, education, health and public sectors, amongst others. We characterise this employment collectively as 'wider landscape activities'.

RETAIL SALE OF GARDEN GOODS

To understand the impact of garden goods retailing, we begin with the household spending estimates as developed previously. We combine this with ABS figures for turnover among specialist garden centres and pet stores (that are presented in aggregate within the ABS). We adjust for the increment of this turnover that is accounted for by specialist pet stores, using the relative proportions of horticultural and pet-related consumer spending in ONS' Family Spending Survey. This was sense-checked against the Horticultural Trades Association's (HTA) estimates of aggregate garden centre turnover, drawn from industry surveys.

Once we estimated how much of households' horticultural spend flowed to garden centres, we assigned the rest to non-specialist retailers (i.e. supermarkets). We then used ABS data on general retailers' output, employment and productivity to quantify how many employees this spending supported; and how much GDP was generated as a result. The employment and GDP of garden centres was then estimated, again using ratios from the ABS.

For both general and specialist retailers, ABS figures allow the estimation of retail margins as a proportion of overall turnover. These margins amount to the gross output of a retailer, and are distinct from total turnover, since turnover also encompasses the value of stock that the retailer has sold. By excluding the value of the goods themselves, we ensure that we do not double-count: retailers accrue only that revenue that is attributable to their retail services (i.e. their margin); and manufacturers accrue the revenue that is attributable to the value of the goods.

WHOLESALE OF GARDEN GOODS

Our estimates for wholesaling begin with ABS figures for GDP and employment among the sector 'wholesale of flowers and plants'. This describes the direct economic contribution of specialist wholesalers of flowers, plants and bulbs.

To estimate the impact that the trade of horticulture products supports among non-specialist wholesalers, we began with our estimates of domestic production of garden goods. We then included the value of imported garden goods (via trade data from HRMC and Eurostat), to arrive at an estimate of the total supply of horticulture products to the UK market. To this value, we apply average wholesale margins for non-specialist wholesalers, as indicated by ABS. These margins form wholesalers' output, and allow us to derive the GDP and employment contributions sustained by this activity.

ARBORICULTURE

Our estimates for arboriculture draw on ABS data for the sectors 'Silviculture and other forestry activities' and 'support services to forestry'. We adjusted this latter sector, to exclude the estimated proportion of support services that are focussed on logging activity. This adjustment factor drew upon a detailed breakdown of forestry sector employment in Scotland, drawn from analysis by CJC Consulting.[54] This was used since we were not able to identify an employment breakdown for the UK's forestry sector as a whole, that was equivalent in detail.

We also incorporate APS-based estimates of employment within forestry and arboricultural occupations, that fall outside of the forestry sector itself.

TOURISM

Our methodology for horticulture's tourism impact follows an approach developed by VisitBritain, that is intended to establish what proportion of UK tourism activity is motivated by various visitor attractions.[55]

For domestic visitors, their method uses the Great Britain Tourism Survey and the Great Britain Day Visits Survey. This involves quantifying the total value of tourist spending that includes an activity, before measuring the numbers of activities undertaken during these trips, before estimating the extent to which individual activities motivated the trip, using survey evidence.

For international passengers, this survey evidence is not available. Hence, International Passenger Survey (IPS) data on the activities undertaken during inbound visits is used. The total spending of tourists who undertook *only* visits to parks and gardens is undiscounted, while the spending of tourists who undertook other activities in addition is divided by the number of activities undertaken (i.e. for an inbound tourist that visited parks and gardens as well as three other activities, only 25% of their spending is used in the calculation).

[54] CJC Consulting, "The economic contribution of the forestry sector in Scotland" (Final report, 2015).

[55] VisitBritain, "The value of activities for tourism" (Research note, 2015).

Inbound visitors' spending is then discounted again, according to their stated 'trip purpose' in the IPS, using the following discount factors:

- Holiday: 100%
- Business: 25%
- VFR: 50%
- Study: 25%
- Miscellaneous (including multiple reasons): 25%
- Transit: 25%

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