HORTICULTURAL BENEFITS OF THE CLIMATE OF THE SOUTH WEST PENINSULA

The principally important outdoor commercial crops of the area, (see Tompsett, this volume) are winter-heading cauliflowers (locally referred to as "broccoli"), early bulking potatoes, spring greens, strawberries, daffodils, anemones, and plants such as *Pittosporum* and *Eucalyptus* cut for the foliage market.

The peninsula is renowned for its ornamental gardens enriched especially with *Rhododendron, Camellia,* and *Magnolia.* Australasian species such as *Olearia, Acacia, Correa,* and *Grevillea* thrive, as do many palms and very tender species in favoured spots. The Penjerrick, Glendurgan, and Trebah gardens of the Fox family on the Helford estuary on Cornwall's south coast are noteworthy. Also the coastal gardens of Caerhays Castle contain abundant camellias bred by the Williams family. Cotehele, Lanhydrock, Pencarrow, Trewithen, Trengwainton, Ince Castle, and Tresco Abbey on the Isles of Scilly continue a long list of gardens and plant collections which flourish as a result of the generally favoured peninsular climate. A host of plant patrons, breeders, and collectors associated with the favoured area have recognised the potential for horticulture and contributed much to our horticultural heritage.

Opportunities for and Constraints on Horticulture in the South West of England©

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INTRODUCTION

Horticulture in the south west is inextricably linked to the climate which provides both opportunities and constraints regarding what is possible and what is economic. While the more easterly parts of the region tend to reflect national patterns, the peninsula of Devon and Cornwall, and the Isles of Scilly, are characterised by enterprises which seek to exploit the conditions. Horticulturally, the diversity of plants capable of being grown in the peninsula is remarkable and many horticultural businesses, including farms, nurseries, and gardens capitalise on this and see it as a pointer to future development and prosperity. The climate of Devon and Cornwall is characterised by mild winters, cool summers, moderate rainfall at all seasons, humidity, winds, good light, and a long growing season, all of which can tilt the balance in assessing the viability or potential for horticultural enterprise. When one considers the vast range of plants which can be grown in the far south west (some say it is greater than for any other area of its size in the world), the number of commercial crops grown on any scale in the area is rather limited. There are, of course, many significant horticultural businesses in the region, but it does remind us of the climatic and other factors underpinning any enterprise.

TECHNICAL POSSIBILITIES AND COMMERCIAL REALITIES

In the past, the horticultural potential of the South West has often been exaggerated by an uncritical assessment of its potential. A thorough assessment of the climatic and other factors has always been recommended by the advisory services. In today's global competitive market a fully realistic assessment is even more es-

sential. An advisory service booklet produced in Cornwall in 1984 warned that the term "earliness" can be very misleading when applied to the county. Relatively mild winters mean brassicas can be harvested in the winter months and daffodils also respond well. Potatoes may be planted early with little risk of frost, but most spring-sown or planted crops are unlikely to be earlier than those in many inland areas. The early summer of 2002 was a clear example of this. Likewise theoretical concepts of the "first day of spring" can be rather misleading.

Annual reports of the Rosewarne Experimental Horticulture Station in Cornwall between 1951 and its closure in 1989 catalogue the many crops which have been tested in the area. Fruit crops planted in the 1950s suffered such severe wind damage that they were grubbed within 10 years. Many flower and vegetable crops failed for various reasons although the Cornish daffodil crop has become a world leader. The main factor underlying the difference between the huge range of plants capable of being grown in the south west compared with the rather limited number of economic field-scale crops is the innumerable range of different microclimates which the gardener can use compared with the reality facing the open-field grower. The tree ferns of valley gardens such as Trebah and Heligan, the wooded gardens of Caerhays or Trewithen, the coastal gardens of Torbay, or the sunlit upper terraces of Tresco, each offer special opportunities for amazing plant collections and associations.

SOME EFFECTS OF THE MARITIME CLIMATE ON PLANTS AND CROPS

Mildness of the Winter. The relative absence of severe or prolonged frost is Cornwall's major asset. However, hard frosts are not unknown when cold dry continental air races in from the east as happened in January 1963 and 1987. Tender plants in sheltered valleys and protected sites survived while those in open areas succumbed, like the *Pittosporum crassifolium* shelter hedges in the Isles of Scilly. Unfortunately, a consequence of the prolonged season of growth in mild and moist autumns increases the risk of winter killing, something which has often been demonstrated with *Eucalyptus*. Also, an early bud break or blossoming in our protracted spring may increase the risk of radiation frosts to young shoots on vulnerable sites. However, there is an anomaly here, for lack of winter chilling delays bud break and vigour in many woody subjects. Vines and strawberries are two examples of a chilling deficit in the maritime areas. A mild winter reduces greenhouse heating costs if one is merely seeking frost protection, but to maintain a higher temperature lift in windy situations is counter productive.

Coolness of Summer. This is a mixed blessing. For many crops cool weather, especially in early summer, is a major disadvantage because it holds back growth at a time when inland areas of the UK and continental Europe are warming up rapidly. Low temperatures and wind are important factors in the failure of fruit trees to set. Heat demanding crops such as sweet corn, cucurbits, and *Phaseolus* beans do not thrive in such conditions, especially if rainfall is also high. However, Cornish summer conditions are excellent for most hardy ornamental plants and foliage crops, provided they are sheltered. It also suits the establishment of brassica vegetables and is ideal for daffodils which are less prone to *Fusarium* (basal rot) under cool conditions and which initiate flowers best at 17°C. Cool temperatures generally enhance flower colour but greenhouse temperatures can fluctuate greatly, presenting problems.

Rainfall in All Seasons. This is a distinct bonus although it does mean that land-based operations can be severely hampered when a lengthy period of wet weather occurs at a busy time of year, such as the early potato harvest in June 2002. Provision of water storage and equipment is not a high priority but this does not eliminate the need for irrigation in some seasons. Winter rainfall can be heavy and prolonged, leading to soil erosion on sloping arable sites. Steps are being taken to minimise this with headland vegetation silt traps. In the Isles of Scilly, lack of summer rainfall, limited water reserves and a light soil all but prevent most forms of summer cropping.

Humidity. The earliness and severity with which fungus diseases such as potato blight attack the west country is well documented. Fungal diseases need to be controlled on most outdoor crops and some, such as brussel sprouts, are impossible to produce to current market standards because of ringspot (*Mycosphaerella*). A combination of periods of high humidity, wind, and cool temperatures makes fruit trees susceptible to scab and canker, much of which may be aggravated by protracted leaf drop and incomplete abscission. In nursery practice, the propagation, weaning, and establishment of plant material is invariably improved by suitable levels of humidity.

Wind. This is probably the major adverse factor in maritime areas. Winds of gale force are frequent and invariably carry quantities of salt well inland. In addition to physical damage, winds cool plants and the soil, cause a more rapid loss of soil moisture, and hinder operations, especially crop spraying. Unless the shelter is almost total, Japanese maples will not survive in the coastal areas. Similarly many deciduous trees and shrubs, and typically those in the landscape, show severe wind pruning on the seaward side. At higher altitudes inland, scorching winds may come from all sides. Taller crops including fruit trees, vines, runner beans, asparagus, and cane fruits often suffer badly. Intense storms will often cause structural damage and film-clad structures have to be very robust and well installed. The so-called moveable French tunnels present problems. Of course, providing wind breaks, hedges, and screens, provides a partial solution to the wind problem but only over limited areas. While this is appropriate, indeed essential, for intensive units, glasshouse holdings and plant nurseries, larger-scale mechanised crops demand more space in which to operate. Moreover, two of our major field crops, namely brassicas and bulbs, require rotation and hence range widely over the countryside, often on rented land, making sheltering impossible. One advantage of "table-top" and "soilless" strawberry growing is that the production area can be permanently sheltered. Foliage crops also require shelter to avoid damage to the vulnerable shoot tips.

Good Light and a Long Growing Season. This is of particular benefit to nursery growers since the size of plant is a major sales point and thus material may occupy the production area for a shorter time. Not withstanding the possible disadvantages of late unripened growth, the South West nursery grower produces a clean, good quality, well budded plant — camellias are particularly well budded. Foliage crops such as *Eucalyptus* make considerable extension growth in the late summer and autumn, but some species may suffer oedema due to an excess of water uptake over transpiration.

HISTORY AND HERITAGE

The south west of England has long been associated with great gardens, garden owners, and gardeners with vision and skill in breeding, propagating, and growing plants and trees. New introductions from around the world were eagerly sought by nurseries such as Veitch and Son of Exeter and there was much rivalry between gardens during the 19th century, with the prosperity coming from the Atlantic ports such as Falmouth and the thriving mining and industrial activity in which Cornwall led the world. At the beginning of the 20th century the horticultural industry was flourishing, based upon steady growth since the completion of the standard gauge rail link to the north in 1866. The commercial vision is credited to Augustus Smith and his nephew Thomas Algernon Dorrien-Smith of Tresco who, between 1870 and 1880, encouraged several Scillonian farmers to export their narcissi flowers. At about this time volumes of early potatoes and winter vegetables were being sent to London. In 1887, it is reported that Andrew Lawry at Varfell, Penzance, was the first to grow commercial daffodils on the mainland. Over 100 years later, Varfell is today the centre of the world's largest bulb farm. With 1000 acres and an annual replant of 2500 tonnes of daffodils it is part of the Winchester Growers company. Meanwhile the Williams family and others were making fabulous gardens and growing and breeding *Camellia, Magnolia,* and *Narcissus:* the Williamsii hybrid camellias and the daffodils 'Carlton' and 'Saint Keverne' being examples of stocks still important today. *Narcissus* 'King Alfred', probably one of the best known plant names in horticulture was raised by John Kendall in Devon about the turn of the century and Peter Lower of Dawlish popularised the incredibly profitable variety 'Fortune' which was raised at Bath and is actually the 2002 "Daffodil of the year" despite its age. Probably the most important daffodil today is the miniature 'Tête-à- tête' raised by Alec Gray of Camborne about 1940.

CURRENT COMMERCIAL CROPS

Potatoes. Potatoes are probably the longest running crop as it was important during the population increases of the industrial revolution. Initially it was primarily for self-sufficiency but later to supply ships departing from the west country. Today, competition is intense and so production is very specialised to meet particular demands and processing specifications. Over the past 20 years large areas have been grown with film cover and the early crop often uses seed potatoes grown locally in the previous year which are physiologically more advanced. However, if they are over-advanced the crop may lack vigour.

Brassicas. *Brassica oleracea* is a native of the Cornish coast and the industry produces many types of brassicas, excluding brussel sprouts. Swede production is also important, especially on Devon red soils and is a vital ingredient of Cornish Pasties. Technical developments in the seed trade with F1 hybrids and the high standard of module plant raising by specialist raisers has transformed the industry. This, allied to improved growing methods, programming the maturity of cauliflower, close liaison with supermarket buyers who increasingly source assured produce locally, together with the 'Cornish King' quality mark have all brought greater stability and confidence for growers.

Narcissus. The narcissus crop in Cornwall has expanded considerably in recent years and now accounts for 40% of U.K. production and an estimated 20% of world acreage. The reasons are primarily the climatic advantage, allied to new early varieties raised at Rosewarne EHS. There are basically two industries: the large daffodil farms in Cornwall and the smaller family holdings on the Isles of Scilly where *N. tazetta* cultivars predominate. Many technical developments, allied to large capital investment, have made daffodil growing one of the most profitable sectors in the region. The industry does experience cycles, especially in the bulb price, but can obviate this to some extent by retaining more bulbs for flower production, much of which is exported. The new early daffodils have a low cold requirement and the flowering of these and other early cultivars is advancing over the years. Whether this will be a continuing trend as winters become milder remains to be seen. In order to achieve continuity of flowering (basically 3 months in Cornwall and 6 months in the Islands) a wide range of varieties is grown. This has advantages when selling the bulbs into the retail market at home and overseas. Scillonian growers employ some unique advancing and retarding techniques and have also benefitted greatly from breeding work at Rosewarne RHS. A major discovery was the effect of smoke treatment for dormancy breaking of 'Tazetta' varieties.

Nursery Stock. This is an extremely diverse sector covering the whole range of ornamental plants closely allied to the buoyant garden centre trade. The region is rightly important for traditional material such as *Camellia, Rhododendron,* and *Magnolia* largely because of the wealth of stock present in long-established large private gardens and National Trust properties. As in other areas, much production takes place under protection but the climate provides a long growing season with a minimum of frost risk. The region benefits from lime-free water. As an important tourist area with superb landscapes, gardens, and resorts there is a strong link between plant production and the incoming visitors which has been massively boosted by developments such as Heligan and the Eden Project. There is a strong feeling that the potential for expansion in this sector is good. For this to happen the region requires better communications and cohesion. This is now being sought by linking major producers via the Internet. Meanwhile, dedicated smaller nurseries of the south west can supply a remarkable range of plant material with the "exotic" type of garden planting being currently in fashion. Throughout the industry, specialisation is now well established with bedding raisers, liner growers, finished plant producers, and retail centres, with very few of the latter now producing plants.

Foliage. This traditional crop has undergone essential change. Larger-scale growers are now producing *Eucalyptus parvifolia* for the bouquet makers while others are growing a large range of specialist and unusual types of foliage for the floristry trade. Quality control and professional marketing are the hallmark of this new venture which was also established under the "Cornish King" logo aided by European Union funding.

Other Flowers. While the number of flower growers has declined there are some specialist glasshouse growers producing forced lilies, AYR *Chrysanthemum, Alstroemeria,* and so on. There are also very interesting nurseries producing a wide range of crops in the open or under light protection. These include *Agapanthus, Amaryllis*,

Nerine, lily of the valley (*Convallaria*), *Brodiaea, Scilla,* and *Gladiolus ×colvillei.* Together these crops span almost 12 months production and do so without the consumption of fossil fuel.

The south west also has a leading breeder and grower of *Dianthus* show-pinks and flowers are produced throughout the region. This small scented flower is important as a postal item, the very successful "Scent from the Islands" company mails pinks or *Narcissus* according to season. The Duchy College, which now runs Rosewarne EHS, is currently working to revive the 'Saint Piran' strain of anemone, noted for its hardiness, wide colour range, and the potential for avoiding leaf curl disease. This is now on sale at the Eden Project.

Fruit Crops. A major boost was given to early strawberry production by European Union development grants (European 5b scheme). In just a few years a group of highly motivated growers have invested in both glass and polyhouses growing table-top crops for the region's supermarkets. Cold house cropping is not particularly early due to the region's lagging temperatures in April and May but the quality and local freshness is paying off. Night-break lighting is used to compensate for the limited amount of winter chilling received especially with covered crops. This invigorates the plants and lengthens the trusses. More could be done to extend the production into the busy tourist summer months.

Curious Crops. There is an active search for interesting niche crops, reflecting the region's special character and linking into tourism. Plans are proceeding to grow tea (*Camellia sinensis*) in a valley at Tregothnan in south Cornwall. Locally produced wines and cider on well chosen sites complement the tourist business. Attempts are being made to begin small-scale lavender growing on the Isles of Scilly and stinging nettle growing is being studied to produce leaves for Cornish Yarg cheese. Horticultural expertise is also being drawn into habitat restoration, such as the heathland creation project involving Imerys, English Nature, and others. Biomass fuel crops such as *Miscanthus* are being offered specific assistance in Cornwall under European Union Objective 1 funding.

Organic Growing. West of England growers have a strong philosophical and commercial interest in this and the U.K. Government recognises a need to boost home production of organic crops. The South West does face some problems such as the scale of operation, distance from large populations, and technical problems with weeds, fungi, and slugs. There are potential advantages in regard to predators and low aphid pressure. Established under the EU Objective 1 policy (aid for economically less-favoured areas of the EU), the Duchy College Organic Studies Centre and the Soil Association's regional centre for advice and market development are positive steps.

THE FUTURE

Many feel that hitherto untapped opportunities exist throughout the region to capitalise on the strong attraction which people have for the west country and what is has to offer. Future developments in commercial cropping in the region are likely to depend upon the pressure of competition from other regions and from imports. Climate change could be relevant. These factors could interact in a variety of ways but one can see water resources becoming increasingly problematical in the hotter regions of the world. In the south west of England an overall rise in temperature

may be welcomed but rising sea levels will not. Considerable uncertainty exists regarding how coastal zones will be affected, specifically, whether the direction of the Atlantic Current might weaken or change course, making the south west's climate more extreme, prone to storms, intense rains, droughts, and perhaps frosts. Such changes will impact on the whole biological matrix on which our current understanding and policy for agriculture, fisheries, and the countryside depends.Some studies and projections are underway. The scientific community based upon the Universities of Exeter, Plymouth and Cornwall, together with the Eden Foundation, are uniquely placed to study the potential advantages and problems associated with climatic change in the south west so that industry, which includes horticulture and tourism, not only survives but prospers.

Trees and Large Shrubs for Shelter: A Guide to Suitable Species and an Outline of Production Practice©

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INTRODUCTION

The problems caused to the horticultural industry by wind-run are well known. In maritime climates the effects are compounded by the inclusion of blown salt particles in the air. The effects range from visible and physiological damage to plants, to financial costs associated with extra labour for standing up blown-over pots, the value of additional fuel used to heat greenhouses and polythene tunnels, and increased irrigation costs due to evaporation. Wind also causes erosion of soil and aids the spread of harmful pathogens.

Work carried out at Rosewarne Experimental Horticultural Station (now Duchy College, Rosewarne) during the 1960s and 1970s demonstrated the benefits of hedges and shelterbelts and set standards for species selection and planting design still followed today. Many shelterbelts planted in the 1960s are coming to the end of their useful life and work is under way on the best means of replacing them. This paper aims to assist anyone planning a new or replacement living shelter by identifying some of the more successful species and providing basic guidance on their production and establishment.

The mild wet winters and cool wet summers typical of maritime climates enable a wide range of high-value horticultural crops to be grown which in turn justifies the use of shelter planting. Such climates also enable a wide range of species to be used for shelter purposes and allows the inclusion of many evergreen species.

PLANNING SHELTERBELTS

The ideal windbreak or shelterbelt gives a wind-filtering effect of approximately 50% and does not act as a solid barrier. Solid barriers create turbulence. Perhaps the most important questions are what is actually required from the shelterbelt and what is actually being protected? If the protection is mainly to enhance yield or prevent physical damage to crops it is vital that the siting does not negate the protective effects, for example by increasing shade or competing for nutrients or water. Where shelter is primarily to protect greenhouses care should taken to select